An International Game of Risk: Troop Placement and Major Power Competition

Carla Martinez Machain*  Mark David Nieman†  Olga Chyzh‡
Sam R. Bell§

July 13, 2018

Abstract

What strategies are behind major powers’ decisions to deploy forces abroad? We argue that major powers seek to protect ideologically similar states and to signal their military capability. The ability to pursue these goals, however, is constrained by similar ambitions on the part of other major powers. To overcome this constraint, major powers strategically respond to the actions of one another. Our theoretical framework leads us to anticipate temporal clustering among a major powers troop deployments, particularly if a rival recently placed troops within the same region. We also expect that geographically distant deployments will elicit in-kind responses by rival major powers. We test our expectations using cross-sectional-time-series data on troop deployments and a Local Structure Graph model, a network estimator that allows for modeling each troop placement as a function of other deployments, weighted by ideological similarity and geographical distance. Our results provide evidence for each of our hypotheses.

*Associate Professor, Department of Political Science, Kansas State University, carlamm@ksu.edu.
†Assistant Professor, Department of Political Science, Iowa State University, mdnieman@iastate.edu.
‡Assistant Professor, Departments of Political Science and Statistics, Iowa State University, ochyzh@iastate.edu.
§Professor, Department of Political Science, Kansas State University, sbell3@ksu.edu.
Introduction

What strategies are behind major powers’ decisions to project influence abroad? How do they decide when to expand their sphere of influence and when to consolidate it? We contend that major powers strategically anticipate and react to the actions of other major powers as they seek to achieve their foreign policy goals. In other words, major powers compete with one another in order to advance their global political interests.

Non-invasion troop deployments are a key tool for power projection. The locations of these forces roughly correspond to a major power’s sphere of influence. In this paper, we zero in on the strategic logic behind major powers’ decisions on where to deploy troops. We propose two complementary mechanisms behind major powers’ decisions of where to deploy troops: (1) protect and influence ideologically similar states—protégés—and (2) signaling their capability. Our key insight is that, in making deployment decisions, major powers consider not just their immediate foreign policy goals, but also the current and expected actions of other major powers.

Our study is among the first to systematically explore the determinants of where major powers station troops. Doing so fills a major gap in the international relations literature which, despite the growing number of studies analyzing the effects of troop deployments abroad, still lacks theoretical explanations for the locations of non-invasion military deployments. By examining these determinants, we can also draw inferences about the interactions among competing major powers. Doing so helps us assess the conventional wisdom that major powers seek to set up spheres of influence while also reacting to the actions and expectations of their adversaries. While much of the international relations literature assumes that major powers behave strategically (e.g., Bueno de Mesquita and Lalman 1992; Lake and Powell 1999), work in foreign policy analysis tends to challenge this (e.g.,

We use a novel statistical estimator—a local structure graph model (LSGM)—to model major powers’ interdependent decisions to deploy troops abroad. The estimator treats troop placements as network edges that form in response/anticipation of other troop placements: e.g., the US decision to place troops in an ideologically similar state affects, and is affected by, troop placements of US major power rivals, such as Russia. Mirroring our theoretical predictions, the statistical model allows for treating deployment decisions as attempts to consolidate and expand one’s sphere of influence, while simultaneously responding to a rival’s attempts to do the same. Using data from 1981–2007, we find that major powers develop ideologically coherent spheres of influence while also reacting to the efforts of other major powers to expand their own.

Major Power Competition and Troop Deployments

Non-invasion troop deployments, such as establishing foreign military bases or training exercises with allied states, are a long-standing tool of power projection. The act of placing troops abroad is a signal of a major power’s ability to project power beyond its geographical borders, i.e. a tool for demarcation of a sphere of influence. Deploying troops to new locations or regions may indicate an intent to expand one’s sphere of influence, while additional deployments to the same locations and regions may signal an intention to consolidate one’s sphere of influence.

Cold War politics provide a nice example. Major power politics during much of this period was viewed through the prism of US and Soviet efforts to expand their influence throughout the world. Early on, both the US and USSR had clearly demarcated spheres of influence, defined primarily through geographical proximity (the Western Hemisphere and Eastern

\[2\text{There is growing research that demonstrates the necessity to statistically model interdependence (Gallop 2016; Minhas, Hoff, and Ward 2016).}\]
Europe, respectively). As the Cold War progressed, both powers competed for influence in the “Third World,” as well as made forays into each other’s spheres of influence. As the world moved away from colonialism, both superpowers looked to expand their influence to minor powers and former colonies. Much of this competition, particularly in the 1970s and 1980s, took the form of establishing a military presence abroad (Harkavy 1982).

The competition between the US and USSR was consistent with the policy outlined by Kennan (1946), who argued that the “main element of any United States policy toward the Soviet Union must be that of a long-term, patient but firm and vigilant containment of Russian expansive tendencies (861).” The proposed policy was the “adroit and vigilant application of counter-force at a series of constantly shifting geographical and political points, corresponding to the shifts and maneuvers of Soviet policy (862).” The two necessary requirements for pursuit of this policy were the US’ readiness to maintain and expand its influence: a willingness to deploy troops in response to the actions taken by an adversary and to use those deployments as an ideological “counter-force” to the Soviet Union. This implied that US policy included both the development of ideological and geographical spheres of influence, and building a counter to the actions of rival major powers. The approach advanced by Kennan (1946), however, appears consistent with not only the policy pursued by the US, but of other major powers as well.

Recent interactions between the US and Russia, for instance, have continued to follow this dynamic. Russia viewed NATO expansion with suspicion and responded by placing troops in Tajikistan and Uzbekistan (Gibler and Sewell 2006). Following Russia’s annexation of Crimea and involvement in eastern Ukraine, and its holding of military exercises off the coasts of the Baltic states, the US deployed several Special Operations forces to NATO members Latvia, Lithuania, and Estonia in early 2017. In addition, the US and other NATO allies expect to send 8,000–12,000 troops to the Baltic States and Poland.

US-Russian competition is not the only instance of major powers reacting to the deploy-
ment of a rival’s troops with an in-kind response. During the imperial era, Great Britain competed with the US for influence in Latin America and Southeast Asia, while Britain, the Netherlands, and France competed with one another in Asia, and Belgium, France, Germany, and Great Britain all sought to expand their reach during the ‘Scramble for Africa.’

Nor has competition been limited to just the superpowers during the contemporary era. For example, despite being unable to compete globally with either the US or USSR/Russia, France has maintained a desire to lead pacts with minor powers outside of the superpower’s spheres (Schraeder 1995, 541). France has resisted encroachments into areas where it has traditionally held influence, such as Francophone Africa, which French leaders refer to as *chasse gardée*, or ‘exclusive hunting ground’. Acrimonious exchanges between US and French officials highlight that Francophone Africa has emerged as a publicly contested arena of Great Power competition (Schraeder 2000, 396).

Figure 1 provides a visualization of major power troop deployments to minor powers during two time periods: 1985 (Subfigure 1a) and 2005 (Subfigure 1b). It is evident from Subfigure 1a that the UK and France tended to deploy troops to their former colonies in Africa and the Middle East, the US placed troops in Europe, and the USSR placed theirs in the Middle East and Southeast Asia. In addition, each major power—and especially the US and USSR—had troop deployments in close proximity to those of one another.

Subfigure 1b demonstrates that in 2005, these four major powers continued to deploy troops abroad to a number of countries. Russia maintained a strong presence in the Middle East and Central Asia. The US countered with a larger Middle East presence and increased placements in Southeast Asia. Both Britain and France, meanwhile, continued placing troops in Africa, but also expanded their reach into Central Asia.

It is clear from the figures that each major power did not place troops randomly, but instead accounted, to some degree, for the presence of troops by other major powers. While the US and USSR, in particular, place troops near one another, they also appear to have
Figure 1: Major Power Troop Deployments to Minor Powers.

(a) 1985
(b) 2005

Note: Troop data from Braithwaite (2015).

relatively clear spheres of influence. The tendency to place troops in the vicinity of a rival’s troops and the demarcation between spheres suggest that both powers accounted for one another’s troop placements when deciding where to deploy their own troops.

Strategic Troop Deployments

We propose two distinct (yet complementary) mechanisms for how major power’s select the locations of their overseas bases and troop deployments: (1) protection and influence over ideologically similar states vs. (2) signaling their material capability by demonstrating the ability to project power beyond one’s borders.

Troop deployments are among the most direct forms of control and influence at a major power’s disposal. Troop deployments are associated with a tangible security mechanism for protecting the host-state from external threats, as well as an implicit form of coercion on
the part of the major power (Lake 2009; Nieman 2016). While some degree of ideological similarity between the major power and the host is a pre-condition for troop placement—i.e. major powers face difficulty convincing ideologically dissimilar states to accept non-invasion troops—once deployed, major powers are likely to be able to consolidate their influence and bring host-states further into their broad political orbit (McDonald 2015).

Troop placements are also beneficial in that they create an ex ante expectation of major power involvement in a militarized conflict involving the protégé that goes beyond just ideological similarity. First, the deployment itself is costly to the major power and is therefore a credible signal of the major power’s willingness to spend resources on the host-state, as well as facilitate potential intervention to defend their protégé. Gartzke and Kagotani (2017) make the argument that even in the presence of a formal military alliance, a troop presence serves as a strong signal of the major power’s commitment to the host-state: unlike an alliance commitment, which is not frequently updated, the signal of commitment that a major power’s deployed troops send is renewed every time that a military presence is maintained and troops continue to deploy to a host-state (see also Morrow 1994). Moreover, deployments may affect the strength or effectiveness of military cooperation and the probability of military success (Morrow 1994; Fearon 1997).

Second, even small deployments can deter aggression against the host, as the troops serve as a trip-wire (Schelling 1960; Fearon 1997; Gartzke and Kagotani 2017). If the major powers’ troops are killed in an attack on their protégé, this potentially commits the major power to engaging in a larger intervention. Once committed, there is little question that major powers can bring the full brunt of their capabilities to a conflict (Chiba, Martinez Machain, and Reed 2014; Gartzke and Kagotani 2017).

Beyond the direct effects of enhancing their control of and deterring aggression against
protégés, major powers acquire additional benefits by placing troops in multiple states within the same region. Once a major power has deployed troops to one state, it is logistically easier to deploy troops to neighboring states. Moreover, spreading deployments to multiple states within a region not only increases the credibility of the major power’s commitment to each individual state, but also allows the major power greater control over the region as a whole (Allen, VanDusky-Allen, and Flynn 2016; Allen, Flynn, and Van Dusky-Allen 2017). That is, by placing troops in several countries, a major power is better able to respond to threats—internal or external—relatively quickly anywhere within the region.

Based on these observations, we may posit that, the tendency to develop ideologically coherent spheres of influence is a general phenomenon common to other major powers (Lake 2009; Allen, Flynn, and Van Dusky-Allen 2017). This suggests that we may observe clusters (or cascades) of temporally proximate major power deployments to protégés within the same region: each new (or additional) troop placement increases the probability of another troop placement by the same major power or its ally.

**Hypothesis 1:** Major powers are more likely to deploy troops to a protégé if they (or their major power allies) have deployed troops to other protégés within a region.

Kennan’s (1946) strategy not only called for expanding US military influence abroad, but also emphasized the need to react and “contain” Soviet expansion abroad. More broadly, a rival’s troops can create a competitive environment in which a major power, in order to maintain its influence within a region, may be compelled to respond to the placement of a rival power’s troops near their protégés. Moreover, protégés may even request additional troops from a major power in reaction a neighboring adversary hosting troops from a major power’s rival. In other words, major powers’ incentives to deploy forces abroad are amplified by geographical expansion in deployments of a rival major power.

For example, in 2012 the United States announced a new deployment of 2,500 US marines
to Australia. While the official reason for the deployment was the conduct of joint exercises between American and Australian troops, the move was perceived as a counter to growing Chinese influence in the South China Sea (McDonald 2012). Since the initial deployment, American and Australian forces have engaged in “freedom-of-navigation” operations as a way to challenge China’s claim on waters surrounding artificial islands it created in the South China Sea (Perlez 2015). As China has suggested, this dynamic is reminiscent of US Cold War troop deployments along the perimeter of Warsaw Pact members to contain the influence of the USSR (McDonald 2012). Another example is the establishment in 2017 of a US air base in Israel, just eight months after Russia expanded its naval base in Syria (Gross 2017).

The processes described above suggest that we may observe clusters (cascades) of temporally proximate deployments to ideologically dissimilar states within the same region: an action by one major power triggers a reaction by a rival (ideologically dissimilar) major power.

Hypothesis 2: Major powers are more likely to deploy troops to a protégé in response to a rival major power deploying troops to its own protégés within a region.

The first two hypotheses focus on our first proposed mechanism—efforts to influence and protect protégés—affect deployment locations. However, it is also possible that major powers react to the geographical reach of their adversaries’ troop deployments—our second proposed mechanism. Instead of seeking to counter a major power deployment only by placing troops in ideologically similar states, a major power might become more willing to engage in geographic expansion and place troops further afield as their adversaries begin placing their troops further afield. In other words, rather than reacting to the ideology and geographic proximity of an adversaries’ deployments, a major power may react to their adversary’s ability to project force abroad.
By deploying troops to geographically distant locations, major powers do more than just expand their sphere of influence and demonstrate their ambition. Rather, expanding and maintaining a troop presence in a distant or remote location demonstrates their logistical prowess and material capabilities. By deploying troops in distant locations, a major power is better able to overcome the tyranny of distance and enable them to respond more quickly to crises within a remote region, and influence such crises towards a more favorable outcome. In addition, demonstrating such reach not only showcases the strength of a major power, but serves as a warning to rival major powers. These rivals, of course, are likely to provide an in-kind response in order to highlight their own strength. This action/reaction dynamic manifests in that when one major power seeks to expand their positions abroad, a rival major power is likely to respond with distant troop placements of its own.

This logic is nicely demonstrated by the deployment choices made by the US and USSR in the early 1960s. In 1961 the US presence in Turkey became a particularly contentious issue as it deployed Jupiter missiles there, increasing the perceived threat of the US presence in Turkey. The response by the USSR was not to just place troops or armaments near Turkey, but also to expand and place more troops and missiles in Cuba, a more distant deployment.

This set of interactions is consistent with the idea that major powers react to one another, but rather than following each other into protégés within a region, they mimic one another’s strategy in terms of how distant they spread through troops geographically. If major powers are acting in this fashion, we should see support for the following hypothesis:

*Hypothesis 3: Major powers are more likely to deploy troops to more geographically distant minor powers as rival major powers deploy troops to more distant minor powers.*

---

5In the case of the US and USSR, the two main drivers of this competition, deployments that were distant from the US were often close to the USSR, and vice versa.
Research Design

We focus our analysis on major power troop deployments from 1981–2007. We define a state as a major power if it is one of the five permanent members of the UN Security Council—US, UK, France, USSR/Russia, and China. This coding is consistent with previous literature which has defined major powers in terms of their economic power, large military capabilities, and active involvement in the international system (Copeland 2000). Our time frame allows us to explore general action–reaction processes among major powers, as it includes both during and after the Cold War.

The unit-of-analysis is the major–minor power dyad-year or, in the parlance of network analysis, an edge between each of the major powers and all minor power states. The sample contains observations for all such pairs of states that could deploy/receive troops in a given year between 1981–2007, for a total of 18119 observations, consisting of 830 unique dyads between the 5 major powers and 166 minor powers. The dependent variable, Troop Placement, equals 1 if a major power deployed new troops to a minor power in a given year (i.e., an edge is realized), and 0 otherwise. Figure 2 provides a visualization of all realized Troop Placements occurring in 1985 as network edges. Major powers deploying troops are denoted by triangles, while minor powers that received troops are denoted as circles.

Methodology

In order to model the theoretically relevant action–reaction processes of major power troop placements, we use a local structure graph model (LSGM) (Chyzh and Kaiser 2016).

---

6We restrict our sample to permanent members of the Security Council. These five states are also the five recognized nuclear powers, according to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), an important determinant of major power status (Jo and Gartzke 2007). Membership in the P5 and as a NPT’s nuclear power implies recognition by other major powers, another important qualification for major power status (Fordham 2011). Lastly, these five states also tend to be the most active in terms of troop placements; see Table 3 in Appendix.

7Dyads between major powers are excluded from the analysis.
Casleton, Nordman, and Kaiser (2016). LSGM is a type of spatial autoregressive model that allows for modeling the formation of network edges (here troop placements) in response to the (weighted) effect of other concurrent troop deployments (either realized or unrealized).  

Figure 3 provides a visual re-conceptualization of the network in which the unit-of-analysis is a state (Figure 2), as a network in which the unit-of-analysis is a major-minor power dyad. Figure 3 displays each individual troop placement as a point in a two-dimensional ideological space with coordinates defined as state $i$’s and state $j$’s ideal points scores. The $y$-axis is the ideal point scores for minor powers, while the $x$-axis is the ideal point scores for major powers. The major powers shown in the figure are the USSR (on the far left), France and the UK (on the right), and the US (on the far right).

A conceptualization of a network of relationships (ideological distances) among major–minor power dyads (as in Figure 3) provides several new insights over a more traditional
Note: Points are jittered to avoid overlap.

approach of treating international states as nodes and relationships among them as edges (e.g., Figure 2). First, minor powers that receive troops tend to have similar ideal point scores as the major power deploying the troops, implying that major powers engage in ideological consolidation). This is evident by the lack of edges in the top left and bottom right quadrants of the figure. Second, edges that contain France or the UK as major powers are more ideologically similar than those edges in which either the US or USSR are the major powers. Third, there is evidence of at least some geopolitical balancing by the major powers, as Soviet troops placed in Albania are countered by American troops in Greece and British troops in Cyprus.
Most importantly, focusing on the relational dependencies among troop deployments themselves allows us to model each troop deployment as a function of all other contemporaneous or temporally proximate deployments, either realized (troops were deployed) or unrealized (no troops were deployed), weighted by ideological and/or geographic proximity to the given observation. More precisely, the statistical estimator models the realization in each observation as a function of that in all other observations within a *neighborhood*. A neighborhood identifies the degree of (ideological or geographical) dependence between each pair of potential troop deployments. Within each neighborhood, a set of conditional distributions for each observation is defined, given the weighted outcomes in all other observations as well as exogenous covariates (Casleton, Nordman, and Kaiser 2016). Neighborhoods can be defined by either binary characteristics (presence or not within a geographical region) or continuous characteristics (intensity/distance within a lattice) (Chyzh and Kaiser 2016).

More formally, suppose \( i \) is a potential edge in a network of \( n \) edges, where \( i = 1, 2, \ldots, n \) with a location denoted as \( s_i = (u_i, v_i) \) in Cartesian space. Within a neighborhood, \( i \)'s neighbors are denoted as \( \neg i \), where \( y_{\neg i} = y(s_{\neg i}) = \{ y(s_j) : s_j \neq s_i \} \). Neighborhoods are specified as an \( n \times n \) matrix \( w \), where cell \( i j \) is the degree of connectivity between edges \( i \) and \( j \), with 0 on the major diagonal. In our case, neighborhoods are a continuous ideological space (i.e. major–minor power policy similarity) for all minor powers within a geographical region.

The binary random variable \( y(s_i) \) records the realization of the dependent variable (edge) as:

\[
 y(s_i) = \begin{cases} 
 1 & \text{if edge } s_i \text{ is present} \\
 0 & \text{if edge } s_i \text{ is absent.}
\end{cases}
\]

We assume that \( i \) is affected only by its neighborhood, but not the indirect effects of its

---

10 Edges have no connectivity with themselves.
neighbor’s neighbors. That is, a troop deployment is conditioned by the realization of every other deployment in its neighborhood $N_i$, but not those outside of its neighborhood. Thus, we make a Markov assumption of conditional spatial independence of the form:

$$f(y(s_i)|y(s_j): s_j \neq s_i) = f(y(s_i)|y(N_i))$$

(1)

Since the realization of an edge is binary (i.e. new troops are either deployed or not), we assume a binary conditional distribution:

$$P(Y(s_i) = y(s_i)|y(s_{-i})) = \exp \left[ y(s_i) A_i(y_{-i}) - B(y_{-i}) \right],$$

(2)

where $A_i$ is a natural parameter function and $B_i = \log[1 + \exp(A_i(y(N_i)))]$. Conditional dependencies among edges are modeled through the natural parameter function as:

$$A_i(y(N_i)) = \log \left( \frac{\kappa_i}{1 - \kappa_i} \right) + \eta \sum_{j \in N_i} w_{ij}(y_j - \kappa_j),$$

(3)

where $\log \left( \frac{\kappa_i}{1 - \kappa_i} \right) = X_i\beta$, $X_i$ is a vector of exogenous covariates, $\beta$ is a vector of parameter estimates, $w$ is a matrix of connectivities among edges, and $\eta$ is a dependence parameter. $\beta$ represents the instantaneous effects of the exogenous covariates, while $\eta$ captures dependence among observations.

The dependence term, $\eta \sum_{j=1}^{n} w_{ij}(y_j - \kappa_j)$, can make either a positive or a negative contribution to the natural parameter function. The dependence term makes a contribution if the realization of the neighbors’ values exceeds its expectation, $y_j > \kappa_j$, and decreases its value if the observed value is less than the expected value, $y_j < \kappa_j$. If $\eta > 0$, the presence of edges with strong connectivities, $y_j = 1$, has a positive effect and the absence of edges, $y_j = 0$, has a negative effect on the probability that $y_i = 1$. In contrast, if $\eta < 0$, the presence of edges with strong connectivities, $y_j = 1$, has a negative effect and the absence of edges in
a neighborhood, $y_j = 0$, has a positive effect on the probability that $y_i = 1$.

An important feature of this parametrization—and one of the key improvements over a naïve model such as a logit—is the global parameter centering of the dependence term, $y_j - \kappa_j$. This specification effectively prevents over-estimating the effect of neighbors, which are themselves a function of both exogenous (global) and neighborhood (local) effects. The subtraction of the global portion of the effect insures that the local effects are only counted when they carry their own value-added effect. This deals with the well-known issue of conflation between common exposure and diffusion, i.e. do two units share an outcome because both are exposed to the same exogenous factor or due to their mutual influence on each other? In the above model specification, the common exposure is modeled via the global term $\log \left( \frac{\kappa_i}{1 - \kappa_i} \right)$, which is also used for centering of the dependence term to avoid misattributing a local effect to what in fact is simply the effect of common exposure (Kaiser and Caragea 2009). A failure to center by the global parameter, in other words, is equivalent to treating the dependent variable as endogenous for unit $i$, yet exogenous for all neighboring units. This characteristic, absent in most analogous spatial econometrics models (e.g., spatial probit), makes LSGM more appropriate for our application.

Parameter estimates are obtained by maximizing the log pseudo-likelihood (PL), which is the summation of the logs of the conditional distributions (Besag 1975):\(^\text{11}\)

$$\log PL = \sum_i \left\{ y_i \log(p_i) + (1 - y_i) \log(1 - p_i) \right\},\quad (4)$$

where

$$p_i = \frac{\exp(A_i(y(N_i)))}{1 + \exp(A_i(y(N_i)))},\quad (5)$$

\(^\text{11}\)To specify a full conditional distribution, which is necessary to identify the joint distribution, the estimator requires the connectivity matrix $\mathbf{w}$ to be symmetric for all pairs of edges (i.e. $w_{ij} = w_{ji}$) (Kaiser and Cressie 2000). Maximizing the pseudo-likelihood recovers consistent point estimates for Markov Random Fields models, of which LSGM is a special case (Casleton, Nordman, and Kaiser 2016; Guyon 1993).
We also account for temporal dependencies and possible asymmetric effects regarding the realization of ideologically similar edges on the likelihood of observing $i$ (e.g., $i$ is affected by positive outcomes in its neighbors, but not affected by negative outcomes). Substantively, such dependencies imply that recent troop deployments by a major power to a minor power affect the probability that a rival major power deploys troops to a nearby minor power, while the lack of deployments has no effect. An asymmetric approach is relevant to modeling troop deployments, as both major and minor powers likely put more weight on the deployment of rival troops, given that new deployments are relatively rare. In other words, the probability of a major power deploying troops to a minor power is weighted by degree of ideological/geographical closeness of rival major/minor powers who have recently deployed/received troops.

A weighted, asymmetric temporal lag captures the effect of edge realizations in the previous time period. We do this by including a new term, $\sum_{s_j \in N_{it}^1} \alpha w_{ij} (1 - \kappa_{jt})$, to the natural parameter function reported in Equation 2 where $N_{it}^1$ denotes $i$'s neighbors with an outcome $y(s_j) = 1$ in the previous time period $t - 1$, or $N_{it}^1 = \{y_{jt} : y_{jt(t-1)} = 1\}$, $w_{ijt}$ is the $ij$th cell of the connectivity matrix $w$, and $\alpha$ is the parameter associated with the temporal lag. We operationalize the lag to account for troop placements made in the previous year.

When $\alpha > 0$, the probability that an edge is realized increases in response to the number of edges with strong connectivity to $i$ that were realized in the preceding period. Conversely, when $\alpha < 0$, the probability that an edge is realized decreases as the number of realizations within the neighborhood in the previous period increases.

The final natural parameter function includes the asymmetric temporal lag as follows:

$$A_{it}(y_{it}) = \log \left( \frac{\kappa_{it}}{1 - \kappa_{it}} \right) + \eta \sum_{j \in N_i} w_{ij}(y_{jt} - \kappa_{jt}) + \alpha \sum_{j \in N_{it}^1} w_{ij}(1 - \kappa_{jt}).$$  \hspace{1cm} (6)$$

Maximizing the PL function recovers consistent point estimates.
We estimate standard errors from 100 bootstraps after a 50 iteration burnin, as pseudo likelihoods return inconsistent standard errors.\(^{12}\)

## Dependent Variable

Our dependent variable is the realization of an edge, which we treat as *new troop deployments* by a major power in a foreign state. There are 436 instances of *new troop deployments* by major powers in our dataset. This measure includes both initial deployments and increases in the number of troops deployed.\(^{13}\) We operationalize *new troop deployments* using data from Braithwaite (2015), who measures the total number of troops from one state deployed to another in a given year. The data was gathered by Braithwaite from the International Institute for Strategic Studies’ (IISS) publication *The Military Balance*, which gathers yearly information on the military capabilities of states in the international system.\(^{14}\)

We treat all new deployments the same, regardless of size or whether they involve a permanent military installation.\(^{15}\) While we recognize that large deployments can be meaningful in terms of coercive power, our focus is on non-invasion deployments. This means that even a small deployment can be a strong signal of commitment by the major power to its protege, as it can serve as a trip-wire mechanism to involve the major power in conflict if the protege is targeted (Schelling 1960; Fearon 1997). This logic is illustrated by the recent US deployments to the Baltic states in light of Russia’s active foreign policy in the region. The deployments involve only a few dozen troops, but send a strong signal of US commitment to the region (Schmitt 2017). Further, we argue theoretically that given we are dealing with only major powers, there is little uncertainty as to whether the major powers have the...

<table>
<thead>
<tr>
<th>Region</th>
<th>Troop Increases</th>
</tr>
</thead>
<tbody>
<tr>
<td>North &amp; South America</td>
<td>60</td>
</tr>
<tr>
<td>Europe</td>
<td>141</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>52</td>
</tr>
<tr>
<td>Middle East &amp; North Africa</td>
<td>71</td>
</tr>
<tr>
<td>Asia &amp; Oceania</td>
<td>103</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>436</strong></td>
</tr>
</tbody>
</table>

*Note: Geographical regions are based on Correlates of War country codes.*

capacity to significantly increase the size of an existing deployment if they chose to do so (Schelling 1960; Gartzke and Kagotani 2017). Table 1 displays how the dependent variable of new and increases in troop deployments vary by geographical region.

**Independent Variables**

Our first independent variable concerns the degree of local *ideological spatial dependence* between edges—captured by a neighborhood—within a network. Each (potential) major-minor power relationship (edge) where troops are deployed is treated as a node within a network of edges. The ideological score of each of these nodes serves as the \( x \) and \( y \) coordinate in a two-dimensional ideological space. We set the \( x \)-coordinate as the major power, with the \( y \)-coordinate representing the minor power. We measure ideological scores as the ideal point scores based on United Nations General Assembly voting (Bailey, Strezhnev, and Voeten 2017; Gartzke 2000). The Euclidean distance between a pair of nodes (e.g., distance from edge 1 to edge 2) represents the ideological dissimilarity between them. This distance is the connectivity between the pairs of major-minor power dyads. When the distance is small, edge 1 and edge 2 are ideologically similar. If the distance is large, edge 1 and edge 2 are ideologically far apart. We measure *dependence*—\( w \) in Equation 6—as the degree of
connectivity between these edges (major-minor power pairs) within a neighborhood.

We calculate our measure of ideological similarity among major-minor powers dyads within a shared geographical region. We use the Correlates of War country codes to identify five regions: the Americas (country codes <200), Europe (200–399), sub-Saharan Africa (400–599), the Middle East and North Africa (600–699), and Asia and Oceania (700–999). This measure serves to test our first hypothesis; a positive coefficient indicates that major powers are more likely to deploy troops to minor powers when they have deployed troops to ideologically dissimilar states within the region (recall that ideologically dissimilar states have greater values of $w$), whereas negative values indicate that major powers are more likely to deploy troops to minor powers that are more ideologically similar.

To account for short-term temporal dependence, we include a weighted, asymmetric temporal lag. An asymmetric measure of temporal dependence is necessary as new troops deployments are a relatively rare event. The inclusion of an asymmetric lag, of course, allows us to account for changes in the likelihood of troop placements in the event that a major power deployed troops to a minor power in the previous year, weighted by ideological distance, whereas non-deployments have no effect. A benefit of the asymmetric lag is that it lets us directly examine how states respond to the deployments, which enables us to evaluate the second hypothesis—that major powers are more likely to deploy troops to a protégé when a rival major power deploys troops to one of their protégés within a region. When the coefficient on the temporal term is positive, it indicates that the likelihood of troop deployments increases in response to the number of deployments in the previous year on the opposite part of the ideological spectrum. When the coefficient is negative, it indicates that the likelihood of troop deployments increases in response to the number of deployments on the same part of the ideological spectrum.

In addition to ideological dependence, we also include an additional spatial lag, Geographical Distance, to account for dependence in the geographic proximity of troop placements.
This variable captures whether major power deployments are determined not only by the ideological similarity or dissimilarity of nearby deployments, but also by the actual physical location of their rivals’ deployments. Similarly to how we restricted neighborhoods to specific geographic regions when calculating ideological space, for our geographical spatial lag we consider a major power’s reaction to only deployments by rivals. Thus, the variable treats the relevant neighborhood as the continuous geographical distance between all pairs of major-minor power edges where the major powers are rivals. The inclusion of *Geographic Distance* serves to test Hypothesis 3 (on whether major powers deploy troops as a reaction to rival deployments). For example, an edge would include a US-Canada deployment compared to a Russia-Estonia deployment (or a US-Estonia deployment compared to a Russia-Cuba deployment).

We measure *Geographical Distance* as the product of the Euclidean distances between state capitals for each dyad-pair. More formally, denote major powers as $M = \{M_1, M_2, \ldots, M\}$, protégés as $p = \{p_1, p_2, \ldots, p_m\}$, and the latitude and longitude of each state’s capital as $x$ and $y$. Then the geographical dependence between the first major-minor power dyad, $\{M_1, p_1\}$, and the second major-minor power dyad, $\{M_2, p_2\}$, equals to $\sqrt{(x_{M_1} - x_{p_1})^2 + (y_{M_1} - y_{p_1})^2} \times \sqrt{(x_{M_2} - x_{p_2})^2 + (y_{M_2} - y_{p_2})^2}$ as long as the two major powers are ideological rivals, and 0 otherwise.

This measure assigns lower values if both major powers are geographically proximate to their corresponding minor powers (e.g., US–Mexico and USSR–Belarus dyad-pair). In contrast, cases in which two rival major powers are both geographically distant from the corresponding minor powers would score larger values (e.g. US–Turkey and USSR–Venezuela dyad-pair). This measures captures the immediate response of a major power to the troop deployment of a rival. A positive coefficient indicates that a major power is more likely to

---

16We treat the US as the primary rival to Russia/USSR and China, and Russia/USSR as the primary rival to the US, UK, and France.
deploy troops to minor powers when their rival deploys troops to a geographically distant locations, while a negative coefficient implies that major powers are more likely to deploy troops when their rival deploys troops to geographically proximate locations.

We include a weighted, asymmetric temporal lag in order to assess the third hypothesis (major powers deploy troops to more distant locations in response to a distant deployment by their rival). In this case, the asymmetric lag accounts for changes in the likelihood of troop placements if a rival major power deployed troops to a minor power in the previous year, weighted by geographical distance, whereas non-deployments have no effect. Positive coefficients indicate that a major power, in response to rival major power deployments, is more likely to deploy troops at greater geographical distances. A negative coefficient, on the other hand, suggests that a major power is more likely to deploy troops to more proximate geographical distances, as a response to rival troop deployments.

Control Variables

We control for a number of other factors that may influence the decision to deploy troops abroad. For the sake of brevity, we only include a brief description of the variables as well as a citation of the data source. A more extensive discussion of the theoretical justification for the inclusion of these factors can be found in the Appendix. We include in our analysis measures of economic prosperity or hardship operationalized as the growth in energy consumption from the previous to the current year (Singer, Bremer, and Stuckey 1972), minor power military capabilities (Bell and Johnson 2015), whether a minor power is engaged in an international war (Sarkees and Wayman 2010), the amount of trade between a major and minor power (Barbieri, Keshk, and Pollins 2009), and whether major and minor powers share an alliance (Gibler 2009). Finally, to account for the idea that major powers make foreign policy decisions based on their expectations of the future (Levy 1987; Bell and Johnson 2015), we include a measure of the expected changes in power for rival major powers, develop-
Results

To highlight the value-added of the LSGM, we present a set of models estimated using LSGM (Models 3 and 4 of Table 2) alongside the naïve models estimated using a logistic regression (Models 1 and 2). This side-by-side presentation highlights the similarities and differences in inferences associated with each of the estimation approaches. Both pairs of relevant models (Models 1 and 3, and Models 2 and 4) recover very similar estimates of the coefficients and the standard errors on all (exogenous or global) variables, any difference are in the effects of the spatial and temporal lags.

Given the discussed advantages of the LSGM, we focus our interpretation on Models 3 and 4 that present LSGM results. The results of the logistic regressions, which are interpreted analogously, are briefly discussed at the end of this section. In Model 3, spatial dependence is measured in terms of ideological distance, while in Model 4, spatial dependence is measured in terms of geographical distance. The first three variables in the table relate to the three lagged dependent variables capturing spatial (in the case of the first two) and asymmetric temporal (in the case the third one) dependence.

_Ideological Distance_ spatial lag captures the degree of connectivity between (potential)
Table 2: Models of Troop Deployments, 1981–2007.

<table>
<thead>
<tr>
<th></th>
<th>Logistic Regression</th>
<th>LSGM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spatial Lags:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ideological Similarity (by Region)</td>
<td>-0.1919 (0.0981)</td>
<td>-0.3262 (0.1562)</td>
</tr>
<tr>
<td>Geographical Distance (from Rival)</td>
<td>-0.0001 (0.0001)</td>
<td>-0.0002 (0.0001)</td>
</tr>
<tr>
<td>Spatial Lag (t-1)</td>
<td>-0.4764 (0.1139)</td>
<td>1.5493 (0.2486)</td>
</tr>
<tr>
<td>Economic Growth</td>
<td>0.2994 (0.6612)</td>
<td>-0.0097 (0.4680)</td>
</tr>
<tr>
<td>Rival Major Power Changes in Power</td>
<td>-0.0215 (0.0261)</td>
<td>0.0197 (0.0273)</td>
</tr>
<tr>
<td>Minor Power Capabilities</td>
<td>0.2436 (0.0810)</td>
<td>0.1973 (0.1052)</td>
</tr>
<tr>
<td>Minor Power in International War</td>
<td>0.4266 (0.1335)</td>
<td>0.4757 (0.1386)</td>
</tr>
<tr>
<td>Alliance</td>
<td>1.7115 (0.1369)</td>
<td>1.5392 (0.1683)</td>
</tr>
<tr>
<td>Trade</td>
<td>0.2636 (0.0542)</td>
<td>0.2711 (0.0632)</td>
</tr>
<tr>
<td>Constant</td>
<td>-4.1488 (0.1010)</td>
<td>-4.4995 (0.0637)</td>
</tr>
<tr>
<td>(Pseudo) Log-likelihood</td>
<td>-1510.888</td>
<td>-1495.465</td>
</tr>
<tr>
<td>Observations</td>
<td>17289</td>
<td>17289</td>
</tr>
</tbody>
</table>

Notes: 166 minor powers, 830 unique edges. In Models 3-4, standard errors estimated from 100 bootstraps via a Gibbs sampler (concliques algorithm) after 50 burnin simulations and thinning every 10 iterations.

troop deployments within a geographical region. In the model, larger values indicate greater ideological dissimilarity among the observed deployments. The negative and statistically significant coefficient on the Ideological Distance spatial lag variable indicates that major power deployments to ideologically similar states exhibit temporal clustering: each additional deployment increases the probability of another deployment by the same major power or its ally. This is consistent with an empirical observation of multiple temporally proximate instances of troop deployments by the US and Britain to post-WWII Europe. This result is consistent with Hypothesis 1, which posited that major powers are more likely to deploy
troops to ideologically similar minor powers as a function of their own previous deployments or those by the allied states.

The coefficient on the *temporal lag* variable in Model 3 is positive and statistically significant, which indicates a positive relationship between new troop deployments by rival (ideologically dissimilar) major powers within the same region in subsequent time periods. This result mirrors the dynamic posited in Hypothesis 2, which stated that major powers respond to their rival’s placements of troops within a geographic region.

In Model 4, *Geographical Distance* tracks major powers responses to the geographical location of deployments by rival major powers. Larger values of the measure indicate greater *geographical distance* between deployments. The negative and statistically significant coefficient on the *Geographical Distance* indicates that a geographically distant deployment decreases the probability of a geographically proximate deployment by a rival. Although this is not a prediction from our theoretical model, we speculate that this finding is simply an artifact of the geographical locations of the major powers in our data: what is a geographically distant deployment for the Soviet Union turns out to be a deployment proximate to the US. This finding may then reflect rival powers’ tendencies to deploy to the same regions, similar to the logic behind Hypothesis 2.

The positive and statistically significant coefficient on the the *one-year lag* of the *Geographical Distance* variable indicates, however, that geographically remote deployments do increase the probability of the same type of deployments by a rival major power in the next time period. This result is consistent with Hypothesis 3, which expected that major powers are more likely to deploy troops to geographically distant minor powers when their rivals are doing the same.

All control variables behave as expected or are not statistically significant. *Minor Power Capabilities* is positive and statistically significant in Model 3, but not model 4. Both *Alliance* and *Trade* are also positive and statistically significant. Each of these control
variables increases the probability of troop deployments to minor powers.

Taken together, the results of the spatial lags are consistent with our expectations that major power actions are interdependent and responsive to the actions of one another when deciding where to deploy troops. The results indicate that major powers are more likely to place troops in regions where ideologically similar troops are being deployed, and less likely to place troops in a region if an ideologically distant major power has placed troops there. There is also evidence that major powers react to the placement of troops by rival major powers within their own sphere by placing additional troops within the region. These results are consistent with the idea that major powers form and maintain spheres of influence, and indicates that they simultaneously increase their troop presence among multiple protégés within these spheres. Additionally, major powers appear to respond to power projection by a rival by mimicking this behavior in-kind and making deployments to geographically distant locations.

Now that we have interpreted the main results, let us briefly compare the inferences provided by an LSGM to those of a logit. A comparison between Models 1 and 3 reveal one point of major disagreement in inferences from the two models: the coefficient on the temporal lag is positive and statistically significant according to an LSGM and negative and statistically significant according to the logit model. Thus, while the LSGM provides evidence that troop placements increase the likelihood that a rival major power will also place troops within the same region in the subsequent time period—a lagged action–reaction process, the logit regression coefficient provides evidence of the opposite. A comparison between Model 2 and Model 4 reveals two additional differences: neither the coefficient on Geographical Distance nor its lag is statistically significant in the logit model, while both are statistically significant in the model estimated using an LSGM.

We attribute these differences to LSGM’s built-in ability to separate the effect of depen-

---

19P-values associated with Geographical Distance and its lag in Model 2 are 0.27 and 0.95, accordingly.
dence from that of dyad-level covariates by “adjusting” the dependence part of the model by the effect of dyad-level exogenous covariates (recall the subtraction of $\kappa_j$ in the second term of equation 6). In other words, LSGM effectively weights the effect of “less expected” troop placements more heavily than those that are expected based on dyad-level covariates. Meanwhile, the spatial terms in the logit are (by necessity) constructed in a way that would bias the estimates of dependence effects: the naïve estimation procedure is unable to separate the effects of exogenous covariates from those of dependence. The logit attributes any correlation in edge formation among neighbors to the spatial effects. LSGM, on the other hand, is able to find the coefficients that jointly maximize the fit of both global and local parts of the function, thus avoiding mis-attributing undue effects to the neighborhood structure.

To further highlight LSGM’s advantages over a naïve logit, we calculated the percent of correctly predicted troop placements for each model. The results for Models 1 and 3 are presented in Figure 4. We can see that, although predicting a rare event (troop placements occur in less than 2% of the data) is challenging for both estimators, LSGM has a substantially higher average rate of correctly predicted observations (in sample).

Conclusion

Much of the growing literature on power projection through troop deployments has focused on the effects of troop presence on the host country. Much less, at least from the quantitative side, has been written on how the decision to engage in this form of geographic and ideological expansion is made by major powers. This paper is among the first studies to quantitatively study the interactive dynamics between major powers as they decide where to deploy their troops.

We argued that major powers are able to expand and consolidate their influence in the

\footnote{The use of a pseudo-likelihood, of course, precludes the use of likelihood ratio tests. For other goodness-of-fit tests that may be used for LSGM, see \cite{KaiserLahiriNordman2012}.}
Note: Density for logit is shown in red; density for LSGM is shown in green. Kernel density plots are based on simulations from Model 1 and 3 (100 each).

international system through the deployment of their forces abroad. For a major power, placing troops in a protégé state is a particularly strong way to signal its commitment to protecting that particular minor power and thus deter attacks against it. A troop presence adds credibility to the commitment, even in the presence of an existing alliance, as having the trip-wire of the major power’s forces physically present is a way in which the major power strengthens its promise to support its protégé. By placing troops across various minor powers, major powers are able to establish spheres of influence beyond their geographic borders. Consistent with this explanation, we find that once a state deploys forces to a minor power, it is more likely to consolidate its influence in the region by deploying forces to other states that are ideologically similar to it.

Major powers do not deploy troops in a vacuum, and several major powers may be
competing for influence within a region. We find that deployments from major powers tend to cluster in distinctive spheres of influence, and that additional forces are deployed to a region in response to rival forays into one’s sphere. We also find that major powers respond to their rivals’ troop deployments within a geographical region by consolidating their sphere of influence with additional troop deployments of their own. Finally, we find that major powers respond to their rival’s distant deployments by expanding their own geographical spheres of interests. Cases in which a major power chooses to expand its influence by projecting its power to a geographically distant location are likely to elicit a similar attempt at a geographical power projection by a rival.

While our findings are driven, in part, by competition between the US and USSR/Russia, we note that other major powers, such as France, also actively use troop deployments to consolidate their spheres of influence in response to other major powers’ deployments. Further, by looking both during and after the Cold War, this study helps us understand what competitive force projection dynamics between the United States and an increasingly active Russia will look like as a post-Cold War Russia takes on a more active posture in Europe.

In recent years, Russia has engaged in aggressive territorial expansion targeted at two of its neighbors, Georgia and Ukraine. Following these conflicts, there is a growing possibility that Russia may continue its territorial expansion into other former Soviet states, specifically, Estonia, Latvia, and Lithuania. These three states are particularly relevant because they are all NATO members, and an attack against them could lead to an invoking of NATO’s Article V, potentially drawing the US and its NATO allies into direct conflict with Russia.

A recent policy suggestion to avoid the scenario of direct conflict between nuclear powers has been for the US to deploy troops to the Baltic states in effort to deter an initial Russian invasion (Shlapak and Johnson 2016). Our findings suggest that this is unlikely to happen, and that the US would be more likely to deploy troops to areas in which it already has built up a military presence, such as Central Europe, rather than place troops closer to Russia’s
sphere of influence.

Though our current temporal domain excludes China’s recent deployments to the Horn of Africa, this work may also speak to future interactions between China and the US as China begins to more actively deploy its troops abroad. A future research question to address would be whether interactions between the US and China will be similar to those between the US and Russia, or whether they will be more likely to encroach on each others’ sphere of influence. Given that China has not traditionally been active in projecting force, it is likely that almost any deployment could be perceived as an encroachment on the American sphere of influence, and thus be more likely to prompt a reaction from the US and its allies.

References


Online Appendix

Troop Placement Activity


<table>
<thead>
<tr>
<th>Country</th>
<th>Troop Placements</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>589</td>
</tr>
<tr>
<td>USSR/Russia</td>
<td>358</td>
</tr>
<tr>
<td>France</td>
<td>223</td>
</tr>
<tr>
<td>UK</td>
<td>202</td>
</tr>
<tr>
<td>Italy</td>
<td>76</td>
</tr>
<tr>
<td>East Germany</td>
<td>68</td>
</tr>
<tr>
<td>Netherlands</td>
<td>66</td>
</tr>
<tr>
<td>Singapore</td>
<td>62</td>
</tr>
<tr>
<td>Australia</td>
<td>62</td>
</tr>
<tr>
<td>Cuba</td>
<td>61</td>
</tr>
</tbody>
</table>

Table 3 reports the total number of troop placements abroad, measured in country-years, from 1981-2007. This time frame is helpful in exploring general action–reaction processes among major powers, as it includes both the Cold War and post-Cold War era. As evidenced in the table, major powers do tend to be more active than other states. In addition to the US, USSR, France, and the UK being the most active in terms of troop deployments, they are also more likely to place troops across the globe (than the other states listed in the table).

Control Variables Discussion

We control for a number of other factors that may influence the decision to deploy troops abroad. We begin with the major power’s economic considerations. A major power’s decision to begin or increase troop deployments may be conditioned by its current economic climate. When the economy is strong, the pursuit of foreign policy change is more attractive than when the domestic economy is stagnant (Palmer and Morgan 2006). Thus, in times of...
economic prosperity major powers will be more willing to expand their spheres of influence through troop deployments and even challenge their rivals’ spheres of influence by deploying troops to areas in which a rival has an existing military presence. In times of economic hardship, while we do not expect major powers to completely give up on their global military presence, we do expect to see a relative reduction in it. We operationalize the degree of prosperity or hardship as *economic growth* and measure it as the growth in energy consumption from the previous to the current year. We obtain energy consumption data from the Correlates of War (Singer, Bremer, and Stuckey 1972).  

We also control for a variety of strategic factors at the edge- and minor power-level: the minor power’s military capabilities, whether a minor power is engaged in an international war, the amount of trade between a major and minor power, and whether major and minor powers share an alliance. *Military capabilities* is measured as the military capabilities of the minor power. Military capabilities data are obtained from Bell and Johnson (2015). Minor powers that are currently engaged in an international war may affect troop deployments by major powers to contain a conflict. We measure *international war* using data from the Correlates of War project (Sarkees and Wayman 2010). We expect that major powers that have a defensive pact with a minor power are more likely to send troops to their ally. We measure alliances using data obtained from Gibler (2009). Finally, we expect that major powers with large trade volumes with a minor power are more likely to deploy troops with the minor power. We measure trade between a major and minor power using data from the Correlates of War project (Barbieri, Keshk, and Pollins 2009) and log it to control for skewness.

Finally, we account for strategic actions on the part of major powers to one another’s future expected growth. Existing research suggests that states in general, including major

---

21 We use energy consumption rather than GDP growth based on data availability for Russia/USSR prior to 1991.
powers, do not conduct foreign policy solely on what is observable in the present, but also what they expect in the future. Research on preventive war, for example, illustrates that leaders’ expectations of an adversary’s future growth in power influences the decision to take preventative action (Levy 1987; Bell and Johnson 2015). To model this we employ a measure of expected military power developed by Bell and Johnson (2015, 126-127).

Bell and Johnson estimate a model to generate predicted future values of power for each state. The dependent variable in the Bell and Johnson study relies on two observable components—military spending and military personnel—from the composite index of national capabilities (Singer, Bremer, and Stuckey 1972). The dependent variable is regressed on a set of covariates that are expected to predict military power that are readily observable to other states: economic capacity, the presence of international threats, and domestic political factors. The resulting coefficients and the values for the current year’s covariates are then used to generate fitted values for the next year. For additional details on how the variable is constructed, see Bell and Johnson (2015, 126-127). We subtract this predicted value by the current year to calculate the expected change in power. We expect that major powers are responsive to expected changes in power for rival major powers.  

\[\text{Expected change in power} = \text{Fitted value for next year} - \text{Current year value}\]

We follow the same coding rules to identify rivals as in fn 16.