

**Alliances versus Federations:
An Extension of Riker's Analysis of Federal Formation**

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Abstract

This essay explores the distinction between federations and alliances and asks the question: When will states choose to federate rather than ally? William Riker (1964) argues that a necessary condition for a federal state's formation is that those offering the federal bargain must seek to "expand their territorial control, usually either to meet an external military or diplomatic threat or to prepare for military or diplomatic aggression and aggrandizement." This argument, though, does not tell us why states sometimes respond to threats by forming federations and at other times by forming alliances. Here we address this issue directly and use a formal model of alliance formation to illustrate our argument. Briefly, that model assumes that states have initial endowments of military and economic resources, where economic resources enter utility functions directly and are what states maximize and military capability influences preference only insofar as it determines a state's ability to counter threats. State can divert economic resources to military spending, and alliances, in turn, are self-enforcing coalitions designed to augment a state's offensive or defensive capabilities. Federations, which serve the same ends as alliances, are coalitions that need to be enforced by the "higher authority" established when the federation is formed. Our operating assumption is that states seek to form a federation in lieu of an alliance if and only if (1) a stable alliance partition does not exist or, if one exists, it is dominated by an unstable partition and (2) if the cost of the loss of sovereignty to each state in the federation is offset by the gains from joining it, relative to what that state secures as its security value.

Alliances versus Federations: An Extension of Riker's Analysis of Federal Formation

In his seminal volume on federalism, William Riker (1964) argues that a necessary condition for a federal state's formation is this: those offering the federal bargain must seek to "expand their territorial control, usually either to meet an external military or diplomatic threat or to prepare for military or diplomatic aggression and aggrandizement ... [and those] who accept the bargain, giving up some independence for the sake of union ... [must] do so because of some external military-diplomatic threat or opportunity" (p. 12). Riker defends his hypothesis with an exhaustive survey of the origins of federal governments, beginning with the United States, but with reference as well to earlier ones such as the 16th century Dutch Federation. His argument, though, is incomplete, because it fails to consider the distinction between *federations* and *alliances* and because it fails to ask why states sometimes respond to external threats by forming federations and at other times by forming alliances.

Precise distinctions are impossible, but it seems evident that the formation of a federation entails the abrogation of a greater degree of sovereignty than does that of an alliance. If cooperation means "sacrificing some degree of national independence with a view to coordinating, synchronizing, and rendering mutually profitable some of the political, military, or economic policies the cooperating nations intend to pursue" (Wolfers 1962, p. 27), then a federalism is merely a more extreme form of an alliance. Differences may not be quantifiable, but a federal government has supremacy in both domestic and international matters over the federation's constituent units whereas in an alliance states retain their sovereignty, separate identities and even, in most cases, separate militaries. So if we accept his premise as to the motivations that underlie a federal state's formation (which, admittedly, is not altogether uncontested), the question Riker's analysis leaves unanswered is why states, when confronting an external threat, would agree to some maximal loss of sovereignty over a seemingly

more flexible commitment to merely ally?

Riker implicitly evades the necessity for answering this question by not calling his conditions sufficient: "I am tempted ... to assert that these two conditions are together sufficient. But, since I cannot possibly collect enough information to prove sufficiency, I am constrained to assert only the more modest hypothesis of necessity" (1964: 13). Absent a proof or some demonstration of sufficiency, we cannot exclude the possibility that similar circumstances will sometimes result in the formation of a federation and, at other times, something else. Or, to put the matter differently, if we extend Riker's analysis to include economic as well as military threats to better understand, say, the motives behind the formation of the European Union or the likelihood of a meaningful Confederation of Independent States taking the place of the Soviet Union,¹ then until we answer Riker's unasked and unanswered question, we cannot predict the ultimate form of that Union or of that Confederation. Are the economic threats that confront European states sufficient to ensure some maximal abrogation of sovereignty in what are otherwise domestic economic affairs, or can we anticipate that they will agree only to more temporizing forms of cooperation designed to meet minimal common needs -- forms that may easily fracture when those needs are no longer apparent? And are the economic dislocations engendered by the dissolution of the Soviet Union sufficient to generate a new, less authoritarian federation, or will the CIS remain, as seems likely, largely a fiction and an excuse for the presidents of member states to visit each other's capitals?

It may, of course, be true that federations form for reasons other than or in addition to the one Riker cites, such as the desire to achieve various economies of scale in the provision of public services or to contain and efficiently regulate certain externalities -- the usual suspects in justifications for

¹In fact, long after the publication of his volume, Riker accepted the proposition that his original argument should be extended to include economic threats for precisely the reason of explaining the European Union --in this case the economic threats from the United States and Japan (private communication)

cooperative or collective action. We cannot discount, for example, the fact that an event such as Shay's Rebellion -- a purely domestic matter -- became a salient concern to the American confederation's most populous states owing to a common east-west, creditor-debtor geography. Nevertheless, if we take Riker's analysis as our starting point and, with the exception of economies of scale in the provision of defensive or offensive military capabilities (or defensive and offensive economic capabilities, in the extension of his analysis), ignore such matters, then theorizing about the choice between federation versus alliance formation requires that we consider when the costs of a loss of sovereignty associated with joining a federation, whatever those costs might be, can be offset by a lessened need to spend economic resources on military capability so as to allow a state greater opportunity to enjoy the fruits of its economy. That is, our question becomes: under what conditions would a state forgo forming an alliance and instead choose to abrogate its sovereignty by participating in the formation of a federation? Or, to ask this question differently, are there conditions under which a state would prefer to abrogate its sovereignty and join a federation rather than an alliance in order to spend less on military capability so as to 'enjoy' a greater share of its economic product?

To transform this question into a more formally stated hypothesis that allows us to model the opportunities states confront for augmenting their power through alliances or federations we offer an analysis in which states maximize social welfare and where the importance of military capability is endogenously determined by the interplay of this objective and the opportunities to form alternative alliances or federations. More specifically, we assume that states have initial endowments of military and economic resources, where economic resources enter utility functions directly and are what states maximize. In contrast, military capability influences preference only insofar as it determines a state's ability to expropriate economic resources from others or to counter threats against it. Economic resources, though, are convertible into military capability, but once converted we ignore the potential existence of a domestic 'military-industrial' complex that derives benefits primarily from military

spending, and assume instead that such `investments' are not part of the accounting of a state's welfare. A state may be compelled to divert economic resources to military spending, but such spending is only a means for defense of what economic resources remain or aggression aimed at securing additional economic resources from other states or alliances.

Insofar as the distinction between alliances and federations is concerned, an alliance is simply some collection of agreements pertaining to joint offensive or defensive actions. More importantly, a **stable alliance** is an alliance in which all states share a common-knowledge understanding that it is in all member's self-interest to abide by those agreements. A federation, in keeping with Riker's analysis, seeks to serve the same ends as an alliance, but unlike a stable alliance, we assume that, in the form of a purely voluntary confederation (like the United States under the Articles of Confederation) it is not in and of itself self-enforcing. That is, in keeping with the idea that a federation entails some maximal loss of sovereignty, here we conceptualize the formation of a federation as entailing the creation of a new `higher authority' (a national government) empowered to ensure that its members act in the collective interest and not defect on the basis of individual self-interest. In short, a federation is an otherwise unstable alliance, in which case our question is transformed once again to: When states are given the choice between joining a stable alliance versus an unstable coalition, when might they prefer to render that coalition stable through the abrogation of their sovereignty?²

Insofar as the structure of this essay is concerned, Section 1 offers elementary notation about

²With reference to the literature in international relations concerning the goals of states, our treatment of the tradeoff between economic and military capability parallels Powell's (1991, 1993) analysis, where the weight given to absolute versus relative resources is endogenous. In fact, the structure of the model, including our accommodating potential asymmetries between offensive and defensive capabilities, is identical to the one Powell formulates. But because we are concerned primarily with alliances and federations, here we focus on the interplay of economic and military resources in an n -country context in which the ultimate configuration of goals -- a state's "taste" for power versus wealth -- is determined by the opportunity to form coalitions of different types.

economic and military resources, about the efficacy of military power, and about the game we assume states play after making their decisions about alliance formation and federation. Section 2 considers the different equilibria that can prevail when the possibility of defensive alliances and confederations are excluded and when states are modeled as taking a myopic view of strategic possibilities. Section 3, in contrast, assesses the advantages of different coalitions when states make a comprehensive assessment of consequences, and Section 4 applies this analysis to the choice between alliances and confederations.

1. Basic Structure

To understanding why federations as opposed to alliances form, or why states ally in any form, we need to understand the inter-relationship of primary and instrumental goals as part of some general equilibrium processes (Niou and Ordeshook 1994b). Thus, after letting $N = \{1, 2, \dots, n\}$ denote the set of relevant countries, we assume that the status quo is described by three vectors: First, $m = (m_1, m_2, \dots, m_n)$, describes the military capabilities of each state; second, $d = (d_1, d_2, \dots, d_n)$, describes the defensive capabilities of each state -- the advantage of the defense over the offense with the idea that it takes Xd units of offense, with $d \geq 1$, to overcome X units of defense; and finally, $e = (e_1, e_2, \dots, e_n)$ describes what each state maximizes, its economic resources. Of course, m , d , and e are merely notation, and we do not want to argue that any of these vectors has anything more than an imprecise empirical referent. Thus, it is best to think of these vectors as summarizing qualitative concepts that we know can be operationalized only in ad hoc ways. Nevertheless, characterizing the status quo by the triple $S = (m, d, e)$ allows us to accommodate the following things:

1. *Separability of military and economic capabilities and resources:* Ignoring the possibility of a military-industrial complex that values m_i for its own sake (Powell 1993), military capability is valued only to the extent that it is instrumental for securing or defending economic

resources. Hence, we assume that each state i maximizes e_i , and is concerned with m_i only to the extent that it influences i 's ability to defend e_i or to secure by way of expropriating it from other states.

2. *Productivity (or absence thereof) of military capability*: States can spend economic resources to purchase military capability (for simplicity, in the ratio of 1 to 1). But once a share of economic resources is "spent," the resulting military capability cannot be consumed or put to any productive use other than to defend the state against aggression or to commit aggression against other states. That is, increased military capability does not generate externalities that add to a society's overall productivity or wealth.
3. *Asymmetry of defensive and offensive capability*: It is generally assumed that the defense holds the advantage in military adventures. The vector d allows military power to be asymmetric with respect to offensive and defensive capability -- i can overcome j only if $m_i > m_j d_j$.³
4. *The spoils of war*: Rather than suppose that the military capability of a defeated country accrues to the victors, differentiating between m and e allows us to suppose that it is only a country's economic base that is transferred to and of value to such a winner. If, for instance, i eliminates j , then i 's military capability remains at m_i whereas its economic base increases to $e_i + e_j$.

To this structure we need to add one additional assumption; namely, that in addition to maximizing its economic base, a country, or at least the regime that rules it, wants to survive. In other words, we assume that heads of regimes have lexicographic preferences -- preferring above all else to

³Ideally, we would want d to be a matrix, where d_{ji} is j 's defensive advantage with respect to i , since doing so admits of considerations of geography to the extent that j may need fewer resources to defend against i than against another state k . In effect, then, our analysis assumes that $d_{ji} = d_{jk} = d_j$ and ignores geographic asymmetries.

survive, and only after that to maximize the economic resources of the countries they lead. Hence, our analysis differentiates between elimination and merely setting $e_i = 0$, and we assume that if given a choice between survival with $e_i = 0$ and elimination, a country chooses survival. This assumption, though, is not as innocuous as it might first appear, at least when combined with other assumptions. Specifically, notice that if a country spends to zero, it is of no value to any other (aside from the elimination of potential threats or the military weight it might add to an alliance or federation) since other countries only value the economic resources they can extract from it. Thus, setting $e_i = 0$ is equivalent to swallowing the proverbial 'poison pill' and serves as a threat countries can employ when threatened with elimination. That is, in the analysis that follows, countries can often preclude the formation of a threatening alliance or federation by the counter-threat of setting $e_i = 0$ and thereby rendering that threatening alliance or federation ultimately unprofitable.⁴

2. A World of Cynics and Pessimists

Although our objective is to distinguish between alliances and federations as responses to the security dilemmas states confront, we consider first the strategies states choose if they maximize their security level from the perspective of utter pessimism -- from the view that any offensive or defensive coalition they might join is inherently unstable and that it is secure if and only if it can defend its own interests without assistance from anyone else. We proceed with this initial assumption not merely out of intellectual curiosity, but to set the stage for the evaluation of a fuller treatment of the incentives to

⁴Admittedly, this fact imbues our analysis with a degree of stability -- the threat that precludes threats -- that might not actually exist in reality. However, we adopt the 'poison pill' assumption here not because we believe it is the only one that might describe alliance and federation formation processes, we do so to render an otherwise complex n -country analysis analytically tractable. The stability our assumption might artificially create seems an acceptable cost since our primary goal is not to specify in some general analytically abstract way the circumstances under which a federation versus an alliance will form, but rather to provide the conceptual tools for distinguishing between these two categories of cooperation and the motives that dictate the choice of one category over another.

cooperate with self-enforcing agreements. Thus, without distinguishing between alliances, federations, and coalitions, we offer the following result:

Result 1: *If each state assumes that any coalition it might join is unstable, then $S = (m,d,e)$ is stable if and only if, for all i in N ,*

$$m_i d_i \leq \sum_{j \in N - \{i\}} m_j \text{ then } e_i = 0.$$

Otherwise,

$$m_i d_i - \sum_{j \in N - \{i\}} m_j = \min(e_i, \sum_{j \in N - \{i\}} e_j)$$

The first expression states that if i 's military and economic endowment is less than the aggregate military endowment of the other states, taking into account i 's defensive advantage, then S is stable only if i spends to 0, since otherwise, given our assumption of utter pessimism, I would suppose that as long as $e_i > 0$, it will be eliminated by some combination of the other $n-1$ countries. The second expression concerns states with relatively greater military and economic capability. The expression excludes the possibility that it is worthwhile for the other states in the system to spend the additional economic resources necessary to capture i 's economic resources and that states achieve their goals with the minimal expenditure of economic resources.

Admittedly, the expressions that form Result 1 are not always easily interpreted. Thus, we turn to some examples to illustrate this result's meaning.

Example 1: Consider the 2-country system $S' = [(100,100),(1,1),(150,50)]$. Suppose country 2 reasons thus: "if I spend 25, then country 1 must spend 25 to overcome me. But if I am left with only 25 economic units, it is not worth it to 1 to spend additional resources to absorb me." So suppose the system first moves to $[(100,125),(1,1),(150,25)]$. But now 2 can

overcome 1 and so 1 must invest at least 25 to defend itself, thereby producing the outcome $[(125,125),(1,1),(125,25)]$. Now 2's earlier reasoning no longer applies -- once having spent 25, 1 might as well spend an additional unit to eliminate 2 and secure 2's economic resources. In anticipation of this, 2 should spend all of its resources initially, rather than only 25 units. And in anticipation of this move by 2, 1 spends 50 units to defend itself. Hence, the final stable outcome is $S = [(150,150),(1,1),(100,0)]$.

Notice that in this example, one country (2 in this instance) spends all of its economic resources. This fact can be generalized thus for 2-country systems:

Remark 1.1: *If $n = 2$, and if $d_1 = d_2 = 1$, then S is stable only if $e_i = 0$ for one or both countries.*

This remark, though, depends critically on the assumption that no state enjoys a defensive advantage. To see this, consider another 2-country example.

Example 2: Suppose $S' = [(100,100),(2,1),(100,100)]$, so that countries 1 and 2 are wholly symmetric except for their defensive capabilities. This asymmetry is reflected in the final, uniquely stable outcome, $S = [(100,150),(2,1),(100,50)]$. Owing to 1's defensive advantage, 2 cannot successfully attack 1. Moreover, although 1 can defeat 2 by converting slightly more than fifty units of economic resources to military capability, 1 can only hope to win fifty units of economic resources in the process. So S is stable.

This last example occasions two questions. First, beginning at some status quo, $S' = (m',d',e')$,

is there an attainable stable S ? By attainable we mean a system that can be achieved by way of some "reasonable" pattern of military spending. Second, if such an S exists, is it unique -- is there any path dependence here? In fact, the answer to both questions is straightforward once we notice that by focusing on the security values of individual countries and by supposing that each state seeks merely to maximize its security value, we have effectively decoupled individual decisions so as to assure the validity of the following result:

Remark 1.2: *Every status quo implies a uniquely stable S .*

Note that one implication of this remark is that if two states are identical with respect to the status quo values of m , d , and e , then they are necessarily treated identically in equilibrium. Also, as a generalization of Remark 1.1,

Remark 1.3: *If $d_i = 1$ for all i in N and if no country can make itself militarily predominant, then the uniquely stable S has every country converting all of its economic resources to military capability.*

Proofs are offered in the appendix, but the logic of these remarks can be illustrated by two 3-country examples, one with symmetric defensive values and the other with asymmetric ones.

Example 3: Suppose $S^* = [(100,100,100),(1,1,1),(150,100,50)]$. Remarks 1.2 and 1.3 imply that the uniquely stable system here is $S = [(250,200,150),(1,1,1), (0,0,0)]$. Starting at S^* , 1 looks safe if it increases its military capacity to 225, since this leaves it with 25 economic units and since 2 and 3 must spend 25 to overcome 1. So let the system first move to $[(225,100,100),(1,1,1),(25,100,50)]$. But now 2 (3) must transform all of its economic

resources to ensure survival against the combined initial capabilities of 1 and 3 (1 and 2). Thus, everyone can anticipate $[(225,200,150),(1,1,1),(25,0,0)]$. But then 2 and 3 can overcome 1 if 1 does not increase its military capacity further. Indeed, 1 must spend its remaining 25 economic units to ensure survival, which yields the asserted equilibrium.

Example 4: If we now increase 1's defensive capability so as to generate the status quo $S^* = [(100,100,100),(2,1,1),(150,100,50)]$, then the unique equilibrium becomes $S = [(175,200,150),(2,1,1),(75,0,0)]$. Countries 2 and 3 must spend all of their economic resources to ensure their survival. But 1 can take advantage of its relative defensive invulnerability and spend only half its economic resources on military capability.

3. **Toward a Less Myopic View**

The preceding analysis gives us some insight into the strategic imperatives of a state when it bases its actions on the presumption that only coalitions directed against it can be sustained and, when calculating its security value and corresponding response, that other states may even act irrationally. Letting this be the background against which states evaluate the utility of alliances and federations, suppose countries act less myopically, suppose they assume full rationality on everyone's part, and suppose events unfold according to the following sequence:

Stage 1: Countries form coalitions, alliances, federations, etc.

Stage 2: Assuming that the agreements from Step 1 are binding, countries decide how much additional military capability to purchase

Stage 3: States can defect from their agreements, and, if they choose, attack others in order to

eliminate them from the game and absorb their economic base.

Finally, with the new status quo established in Stage 3, the system returns to stage 1 and the process repeats itself.

To convert this three-stage scenario into a tractable model requires a clearer conceptualization of what we mean by an alliance. Briefly, then, if we interpret an alliance as a limited collective security agreement in which alliance members agree not to threaten each other and to defend each other from threats originating outside of the alliance (see Niou and Ordeshook 1994a, and Morrow 1994), then

Definition: A *stable alliance* is a coalition formed in Stage 1 such that no one has an incentive to defect to some other coalition. If the *coalition structure* P , which corresponds to the collective security agreements reached in Stage 1, partitions the set of countries, N , into exhaustive and disjoint subsets, then P is stable if, after adjustments are made in Stage 2 as described, no subset of countries will subsequently defect in Stage 3 to generate a different coalition structure -- all coalitions in P are stable .

Rather than proceed to unnecessary formalism, we can illustrate the meaning of this definition and the three-stage process just outlined by returning to Examples 3 and 4.

Example 3 (continued): Earlier, on the basis of Remark 1.3, we argue that if $d_i = 1$ for $i = 1, 2, 3$, then the unique equilibrium has all three countries spending everything on military capability. But this conclusion assumes that two countries will eliminate the third if it is both possible and profitable to do so. Suppose, though, that at Stage 1, countries agree not to

attack each other, thereby forming the coalition of the whole, $\{1,2,3\}$. In accordance with this agreement, no one spends anything at Stage 2 on additional military capability. Now consider the incentives of, say, 1 and 2 to defect from the agreement at Stage 3 by eliminating 3 and somehow dividing its economic resources among themselves. But if 3 is eliminated, Remark 1.1 applies, and either 1 or 2 will have to reduce its economic resources to zero. That is, either 1 or 2 (or both) will not gain from 3's elimination. Since this argument applies to $\{1,3\}$ and $\{2,3\}$, S is stable: no country is eliminated or required to reduce its economic resources to zero.⁵

Example 4 (continued): Suppose $\{1,2,3\}$ forms, and assume, as before, that no one spends to procure additional military capability. But suppose 1 and 3 defect in Stage 3 in order to eliminate 2, divide 2's economic resources 30-70, and thereby generate the new status quo, $[(100,-,100),(2,-,1),(180,-,120)]$. At this point 1 and 3 must readjust their military capabilities. But Remark 1.1 no longer applies since $d_1 = 2$, not 1. In fact, the unique stable S is $[(110,-,165),(2,-,1),(170,-,55)]$. Thus, both 1 and 3 gain from 2's elimination. The threat against 2 is viable, and thus neither $\{1,2,3\}$ nor $[(100,100,100),(2,1,1),(150,100,50)]$ are stable.

Notice that such examples allow us to assess assertions in the literature on international relations about the influence of changes in defensive capability. For example, consider Jervis's (1978:199) argument that "The advantage of the defense can only ameliorate the security dilemma;" Levy's (1984) assertion that "If weapons and policies that protect the state do not provide the capability

⁵If we distinguish system- from resource-stability, S may not be *resource stable* to the extent that subgames of threats and counter-threats may compel states to buy each other off in the event that threats short of doomsday proposals are viable. For a discussion of such threats as well as a formalization of the distinction between resource-stability and system-stability see Niou, Ordeshook, and Rose (1989).

for attack, then the basic postulate of the security dilemma no longer applies;" Quester's (1977:208) argument that "Offenses produce war and/or empire; defenses support independence and peace;" and Hart's (1932: 72) contention that "any strengthening of the defensive at the expense of the offensive is a discouragement to aggression." But Examples 3 and 4 differ only in that 1's defensive capability in Example 4 is greater than in Example 3, and in Example 3, no economic resources are spent on military capability, whereas in Example 4, $\{1,2,3\}$ is no longer stable and one or more countries must procure additional military capability. Thus, although the intuition offered by Jervis, *et al* may apply to 2-country systems, the ideas and intuition gained from focusing on bipolar systems do not always extend to larger systems.

Returning now to Example 4, let us determine the stable systems that can prevail when all strategic possibilities are considered.

Example 4 (Continued): Consider in turn each of the three partitions $(\{1,2\},\{3\})$, $(\{1,3\},\{2\})$, and $(\{2,3\},\{1\})$. First, if $(\{1,2\},\{3\})$ is agreed to in Stage 1, then stage 2 should produce the system $[(100,100,150),(2,1,1),(150,100,0)]$. But now 1 has an incentive to defect to 3, eliminate 2, and, after making suitable adjustments in military capabilities, achieve the stable outcome $[(110,-,165),(2,-,1),(170,-,55)]$. Hence, the coalition structure $(\{1,2\},\{3\})$ cannot be stable. Similarly, if $(\{1,3\},\{2\})$ is the agreement reached in Stage 1, then Stage 2 produces the system $[(100,200,100),(2,1,1),(150,0,50)]$, whereupon 1 has an incentive to defect to 2 and to generate a stable outcome such as $[(110,200,-),(2,1,-),(170,20,-)]$. Hence, the coalition structure $(\{1,3\},\{2\})$ cannot be stable. Finally, consider $(\{2,3\},\{1\})$. Unlike our previous two cases, following the formation of this structure in Stage 1, the Stage 2 economic-military adjustments yield a stable outcome in which everyone retains some economic benefit. Specifically, the system $S = [(167,130,120),(2,1,1),(83,70,30)]$ prevails. Notice, in

particular, that if 1 attacks 2 and thereby threatens to generate the outcome $[(167,-,125),(2,-,1),(158,-,25)]$, then 3 should aid 2: otherwise, 3 must subsequently convert all of its economic resources to military capability and realize a final payoff of 0.

What remains before we can assert that S is stable in this example is to show that neither 2 nor 3 will defect from $\{2,3\}$ to attack the other. But if, for instance, country 2 announces a unilateral defection, then country 3 spends so as to set e_3 equal to 0, country 2 does the same to defend against an attack by 1 and 3, and 1 increases military capabilities to 175 to defend against countries 2 and 3.

4. Alliances versus Federations

Example 4 shows that stable alliances -- stable collective security arrangements -- need not encompass all countries. At the same time, we have also seen that not all "profitable" coalitions -- coalitions that allow countries to retain and consume some share of their economic base -- are stable alliances, and it is this fact that we use to study federations. Turning first to the differences between alliances and federations, and, to repeat some of our earlier distinctions and definitions, building on the treatments of these types of coalitions offered by Riker (1964), Wolfers (1962) and others, we see that there is little disagreement that alliances and federations differ in at least the following qualitative ways:

1. In accord with Riker's definition that a state is federal "if two levels of government rule the same territory" (1964:11), the formation of a federation generally involves a more significant abrogation of sovereignty than does the formation of an alliance. We can appreciate that federations admit the principle of secession (e.g., Ethiopia, the USSR, the Arab League), whereas members of some alliances have been punished for attempting to secede (Hungary

and Czechoslovakia from the Warsaw Pact). Nevertheless, unlike an alliance, the formation of a federation is generally associated with the creation of a central government with the constitutional authority to coerce subunits to its will through the use of military force if necessary.

2. The policy domain of a federation is greater than that of an alliance. An alliance, although it might offer significant economic benefits to its members, is traditionally conceptualized in terms of military issues (hence the current debate and confusion over the objectives of NATO enlargement). The issues relevant to a federation, in contrast, encompass the full range of military-economic-political matters.
3. Citizens, at least in democratic federations, have a "say" in the politics of all federal subjects via national elections or via a national legislature whose laws have supremacy over federal subject law. In an alliance, the domain of democratic governance is restricted to the political subunits that constitute the alliance.

Because forming a federation is more costly to the political units involved in terms of the loss of sovereignty, it must be that they produce something of greater value than an alliance. That something, we believe, can be described thus:

- A. The loss of sovereignty is essential to achieve the offensive or defensive benefits of the federation. Were the federation an alliance -- were the federation a coalition enforced solely by the self-interest of its constituent parts without regard to the coercive authority of a central government -- then that alliance would be unstable.
- B. For each state in the federation, the gains from federation are "sufficiently great" relative to the alternatives. If there are stable alliance partitions that serve as an alternative to the

federation, then those partitions must be less profitable than the federation for all federation members. And if there is no stable alliance partition, then the federation must be more profitable for all members than some "reasonable" lottery over the set of feasible alliance partitions.

Admittedly, items A and B are inferences we draw not from any formal theory, but from our intuitive understanding of how and why federations form. For example, under the Articles of Confederation, the U.S. was largely an alliance -- at least to the extent that the central government had no authority, barring a unanimous vote in the Congress, to tax, raise an army, regulate interstate commerce, or do much of anything else. That the alliance was deemed unstable is clear. Washington and others expressed the fear, for instance, that the Mississippi territories, especially Kentucky, might ally with Spain and that the Northeastern states would choose to "go it alone" or seek reconciliation with England. And as Hamilton expressed his concern, "Considering our distance from Europe, it would be more natural for these confederacies [regions of the U.S. Confederation] to apprehend danger from one another than from distant nations, and therefore that each of them should be more desirous to guard against the others by the aid of foreign alliances, than to guard against foreign dangers by alliances between themselves" (Alexander Hamilton, *Federalist Papers*, no. 6). Thus, there was a general concern that unless strengthened with a more authoritative national government, the American "alliance" was inherently unstable and required some uncommon measure to ensure its viability. That 'uncommon measure' was the abandonment of the Articles of Confederation and the drafting and ratification of a new constitution.

To convert these ideas now into something we can use in our more formal analysis, we offer the following definition:

Definition: P is a federation partition and $F \in P$ a potential federation if

1. P is an unstable alliance partition,
2. for any stable alliance partition, P' , P dominates P' in the sense that $u_i(P) > u_i(P')$ for all $i \in F$; or
3. if there is no stable alliance partition, then P is preferred by all countries in F to the uniquely stable outcome implied by Result 1 and Remark 1.2.

We call F a **potential** federation for three reasons. First, there may exist more than one partition that satisfies the preceding definition and thus more than one coalition that might try to form as a federation. Indeed, as we show later in Example 6, this is generally true whenever there are no stable alliance partitions, since every state must otherwise "overspend" to ensure its continued existence. Second, insofar as there is a loss of sovereignty, we must still contend with the fact that forming a federation is costly to the political elites in each confederating unit. The analysis of this cost lies outside the scope of this essay, and thus we cannot say whether the gains of federation exceed this cost and thus, even if unique, whether a potential federation will in fact form (for progress on this question see Altfeld 1984, Lalman and Newman 1991, and Morrow 1991, 1993). Finally, since F is, by definition, an unstable alliance, its realizability depends on: (1) the feasibility of constructing a central government that can maintain a belief among its constituent units that it can and will sanction defectors (d'Encausse 1993); (2) the relative magnitude of the economies of scale that derive from the federation and the creation of a common market within it; and (3) the skill with which federation members create institutions that render the federation's maintenance in the self-interest of each succeeding generation political elites (Ordeshook and Shvetsova 1996). Because the analysis of these things also lies outside the scope of our analysis, we can only speak of potential federations.

With the understanding that we cannot model here the costs associated with a loss of sovereignty, we can nevertheless extend Riker's analysis of federalism to offer a necessary and

sufficient condition for states to pursue establishing the governmental structures of a federation:

States will seek to form a federation in lieu of an alliance if and only if (1) a stable alliance partition does not exist or, if one exists, it is dominated by an unstable partition and (2) the cost of the loss of sovereignty to each state in the federation is offset by the gains from joining it, relative to what that state perceives as its security value when it confronts only insecure alliance possibilities.

Suppose now that F is sustainable if it is profitable, and that the costs of the loss of sovereignty are not so great as to render the prospect of forming a federation infeasible. There are now three possibilities with respect to any status quo:

- there are one or more stable alliance partitions that are undominated by any federation partition;
- there are one or more stable alliance partitions, all of which are dominated by one or more federation partitions;
- there are no stable alliance partitions, but there is at least one federation partition that dominates any "reasonable" lottery over the feasible alliance partitions.

As our examples show, none of these possibilities can be ruled out: Alliances and federations exist as potential cooperative arrangements under a variety of circumstances. We begin by reconsidering Example 3.

Example 3 (continued): Recall that in this example, the coalition of the whole $\{1,2,3\}$ is the uniquely stable alliance partition. Suppose countries 1 and 2, in order to eliminate 3, form a federation so to effectively change the status quo to $[(200,100),(1,1),(200,100)]$. But now Remark 1.1 applies, and the uniquely stable outcome is $[(200,200),(1,1),(200,0)]$ -- country 3, preferring to survive, converts all of its resources to military capability. Thus, 1 and 2 gain nothing by federating, and since the same argument holds for $\{1,3\}$ and $\{2,3\}$, we see that in this example the only viable alliance is $\{1,2,3\}$, which is to say that the system is equivalent to a collective security arrangement in which no one threatens anyone else.

This example, though, raises the question as to whether there are circumstances in which smaller alliances might form without the possibility of a federation. To that end, consider Example 5.

Example 5: Suppose $S = [(100,150,150),(2,1,1),(100,50,50)]$. There are now three cases. *Case 1:* Consider the alliance partition $\{1,2,3\}$, and suppose $\{1,3\}$ defects to eliminate 2. Then if $[(100,-,150),(2,-,1),(130,-,70)]$ illustrates how 1 and 3 divide 2's economic resources, the eventual equilibrium is $S' = [(110,-,165), (2,-,1), (130,-,55)]$. Since both 1 and 3 prefer S' to S , $\{1,2,3\}$ is unstable. *Case 2:* If $\{1,3\}$ forms initially, then 2 must protect itself by converting all of its economic resources to military capability, so as to yield $[(100,200,150),(2,1,1),(100,0,50)]$. But now if 1 and 2 ally to eliminate 3 and divide 3's resources so as to yield the outcome $[(100,200,-),(2,1,-),(130,20,-)]$, then the eventual equilibrium is the outcome $S' = [(110,200,-),(2,1,-),(130,20,-)]$, which 1 and 2 prefer to the initial outcome. Hence $\{1,3\}$ is unstable (as is $\{1,2\}$). *Case 3:* If $\{2,3\}$ forms, then initial adjustments yield $S' = [(167,150,150),(2,1,1),(33,50,50)]$. Now suppose that 3 defects to form

$\{1,3\}$ and to eliminate 2. If 1 and 3 distribute 2's resources so as to generate the initial outcome $[(167,-,150),(2,-,1),(58,-,75)]$, then the final outcomes after adjustments by 1 and 3 so that neither can threaten the other is $[(167,-,196),(2,-,1),(58,-,29)]$, which 3 likes less than what it gets from $\{2,3\}$. Since this fact holds regardless of how 1 and 3 divide 2's economic resources (or how 1 and 2 divide 3's), $\{2,3\}$ is a stable alliance.

The importance of this example is seen by noticing that the $\{2,3\}$ alliance gives 2 and 3 what they would get from any 2-country federation. If this or any other federation forms, the excluded country must set its economic resources to zero so as not to be eliminated. Thus, no 2-person federation can expropriate resources from the excluded country, in which case neither 2 nor 3 has any incentive to abrogate its sovereignty. Examples 3 and 5, then, establish that federations need not appear even if there are no costs to federation. Now reconsider example 4.

Example 4 (continued): Earlier we concluded for this example that the uniquely stable alliance partition is $P' = (\{2,3\},\{1\})$, in which case the payoff vector $e = (83,75,25)$ prevails. But if, say, the coalition $\{1,2\}$ forms and is exogenously maintained, then both 1 and 2 are better off. With P' they get 83 and 75 respectively, whereas with a coalition $\{1,2\}$ that cannot be disrupted, they sustain the status quo payoffs of 150 and 100 respectively. Hence $\{1,2\}$ is a federation, as is $\{1,3\}$ for the same reasons. Thus, rather than predict the formation of the stable alliance $\{2,3\}$, if the difference in payoffs between forming an alliance and forming a federation is great enough for countries 1 and 2 or 1 and 3, then either 1 and 2 or 1 and 3 will form a federation.

Thus, Example 4 illustrates a circumstance in which a federation partition holds an advantage over

even a stable alliance partition. For the final possibility with respect to illustrating the circumstances under which a federation might form, consider Example 6.

Example 6: Let $S = [(100,150,150),(2,1,1),(50,50,50)]$. Then there are three cases. *Case 1:* If $\{1,2,3\}$ is stable, then $S' = S = [(100,150,150),(2,1,1),(50,50,50)]$ prevails. But if $\{1,3\}$ defect to eliminate 2, they can divide 2's resources to produce $[(100,-,150),(2,-,1),(80,-,70)]$. At this point, 1 and 3 would adjust to reach $S'' = [(110,-,165),(2,-,1),(70,-,55)]$. But S'' is stable and strictly preferred by 1 and 3 to S . Hence, $\{1,2,3\}$ is not stable. *Case 2:* With the partition $(\{1,3\},\{2\})$ -- or equivalently, $(\{1,2\},\{3\})$ -- the countries adjust to $S' = [(100,200,150),(2,1,1),(50,0,50)]$. But now if 1 defects to form $\{1,2\}$ and eliminate 3, we get $[(100,200,-),(2,1,-),(80,20,-)]$, at which point, the countries adjust to the stable outcome $S'' = [(110,200,-),(2,1,-),(70,20,-)]$, which is strictly preferred S' . So $(\{1,3\},\{2\})$ -- and $(\{1,2\},\{3\})$ -- is unstable. *Case 3:* With the partition $(\{1\},\{2,3\})$, the countries adjust to $S' = [(150,150,150),(2,1,1),(0,50,50)]$. But if 3 defects to produce $\{1,3\}$ and eliminate 2, then the intermediate outcome $[(150,-,150),(2,-,1),(20,-,80)]$ results, at which point the countries adjust to $S'' = [(150,-,170),(2,-,1),(20,-,60)]$, which 1 and 3 unanimously prefer to S' . So $(\{1\},\{2,3\})$ is unstable. Thus, all alliance partitions are unstable, and, in fact, if countries 2 and 3 proceed under a different assumption, one or the other will be eliminated. In this instance, each state should proceed in accordance with our analysis of myopic play (Section 2), in which case the uniquely stable outcome corresponding to the one identified by Result 1 and Remark 1.2 is $[(150,200,200),(2,1,1),(0,0,0)]$. Thus, any federation of two countries is profitable.

Although it is not part of our formal analysis, countries 2 and 3 are in a somewhat different

position than 1; namely, if they ally but one of them defects, the other is eliminated. Perhaps more than any of our preceding examples, then, this last one corresponds best to what Riker (1964) has in mind in his analysis of federalism. Here if state 2 and 3 choose to ally, they must do so in the strengthened way implied by the definition of a federation since only in this way can alliance preclude elimination.

5. Conclusions

Riker's analysis of federalism is as much a study of international affairs as it is of the domestic and constitutional politics of federal states. Indeed, that analysis does not try to inform us about the best constitutional design of a federalism, nor does it say much about the structure of intergovernmental bargaining within such a state once it is formed. Instead, it concerns the more macro motives of otherwise sovereign entities to survive and perhaps prosper by either maintaining or upsetting a 'balance of power'. As such, then, it rightfully belongs in the domain of those studies that try to understand balance of power politics through alliance formation and dissolution. However, just as Riker fails to consider alliances as a substitute for federations, students of balance of power politics more often than not fail to examine federations as a substitute for alliances. Put simply, the constellation of states in international affairs is not a constant -- witness the gradual emergence of a unified Europe and the dissolution of the Soviet Union -- and any understanding of international as well as federal stability needs to accommodate this fact.

We offer here a definition of a federation as an alliance that can survive and serve its intended purpose if and only if (1) it is 'more profitable' than any stable alliance that might serve as an alternative for one or more members of the federation (2) it is possible to render the federation stable by some abrogation of sovereignty on the part of each of its members that exceeds that which is required to render an alliance stable. A federation here, then, is an alliance that assumes the form of an independent actor in international affairs. Using a number of numerical examples in which states

can combine in any and all ways and in which they can seek to overcome adversaries by converting economic resources to military capability, we have sought to illustrate circumstances in which only federations are likely to emerge as well as circumstances in which only alliances will appear. Admittedly, those examples are formed using a number of less-than-ideal assumptions, including a static view in which economic resources do not multiply and in which states can make threaten to be unattractive candidates for absorption by the complete depletion of their economic base. Other models and other analyses, then, should follow this one, but now hopefully with the perspective of not divorcing the two subjects of federalism and international alliance formation.

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Appendix 1

Proof Result 1: Given the military capability distribution of the other countries, $m_{-i} = (m_1, m_2, \dots, m_{i-1}, m_{i+1}, \dots, m_n)$, first, if country i 's initial military and economic endowment is less than the aggregate of the other countries' military capability,

$$(m_i + e_i)d_i \leq \sum_{j \in S-\{i\}} m_j,$$

then i needs to convert all its economic resources to military to ensure that others will not have incentives to attack i . Second, if

$$(m_i + e_i)d_i > \sum_{j \in S-\{i\}} m_j,$$

then $S-\{i\}$ will not have incentives to attack i if $m_i d_i - \sum_{j \in S-\{i\}} m_j = e_i$ because i 's military capability is sufficiently large such that $S-\{i\}$ has to convert more of their economic resources to military to overcome i than what they can expect to gain. Finally, if

$$m_i d_i - \sum_{j \in S-\{i\}} m_j = e_i \geq \sum_{j \in S-\{i\}} e_j,$$

then i can reduce its military investment to the level such that

$$m_i d_i - \sum_{j \in S-\{i\}} m_j = \sum_{j \in S-\{i\}} e_j$$

because $S-\{i\}$ only has $\sum_{j \in S-\{i\}} e_j$ to invest in military to overtake i .

We also need to show that no subset of the countries, say C , has an incentive to attack $S-C$. For a coalition C to gain by spending some of its economic resources on military to defeat $S-C$, it requires that

$$\sum_{j \in C} m_j + \alpha \sum_{j \in C} e_j > \sum_{i \in S-C} m_i d_i$$

and

$$\alpha \sum_{j \in C} e_j < \sum_{i \in S-C} e_i,$$

$0 < \alpha \leq 1$. But since for any i that $e_i > 0$, either

$$m_i d_i - \sum_{j \in S-\{i\}} m_j = e_i,$$

or

$$m_i d_i - \sum_{j \in S - \{i\}} m_j = \sum_{j \in S - \{i\}} e_j \text{ if } e_i \geq \sum_{j \in S - \{i\}} e_j.$$

This implies that

$$\sum_{i \in S-C} m_i d_i \geq \sum_{i \in S-C} (\sum_{j \in S - \{i\}} m_j + \sum_{j \in S - \{i\}} e_j) > \sum_{i \in S-C} m_j + \alpha \sum_{i \in S-C} e_j,$$

which shows that it is impossible for a coalition C to gain by converting its economic resources on military to defeat $S-C$.

If a country's investment does not satisfy the condition specified in Result 1, then the system is not stable because either country i will be eliminated or i can reduce its military expenditure to a lower level.

Proof Remark 1.1: Since $d_1 = d_2 = 1$, if $e_1, e_2 > 0$, then if $m_1 \neq m_2$, the stronger country can acquire the other's economic resources by defeating it; if $m_1 = m_2$, one of the countries can convert some of its economic resources to military capability and defeat the other.

Proof Remark 1.2: We can compute the stable outcome using the following algorithm: With respect to the status quo, let all countries that satisfy the first expression in Result 1 set their economic resources to zero. The second equation requiring that

$$m_i d_i - \sum_{j \in S - \{i\}} m_j = e_i$$

now defines a system of simultaneous equations that may or may not have a solution (where a solution requires that all military and economic capabilities be non-negative, and that no state's economic capability exceed its status quo endowment). Suppose it does not solve. Then it must be the case that some additional countries must set their economic resources to zero, owing to those countries that have "spent" their initial economic endowment. After doing so, resolve the set of "second" equations for the countries that remain. Continue with this process, which must eventually solve or have all countries

spend all their economic resources. If it does solve, then it must be a unique solution since the equations are linear.

Proof Remark 1.3: Suppose the contrary is true, $e_i > 0$ for some $i \in S$. Now if

$$\sum_{j \neq i} m_j < m_i' + e_i' - e_i,$$

by assumption,

$$m_i' + e_i' \leq \sum_{j \neq i} m_j' + e_j',$$

then countries in $S - \{i\}$ are not investing enough in military. They should at least invest to level such that

$$\sum_{j \neq i} m_j = m_i' + e_i' - e_i,$$

otherwise they would be defeated by i . But then $S - \{i\}$ can defeat $\{i\}$ by converting some economic resources to military capability. Thus, to prevent from being eliminated, i has to convert all its economic resources to military. Finally, if

$$\sum_{j \neq i} m_j > m_i' + e_i' - e_i,$$

then i has to convert more economic resources to military capability to ensure its survival. This shows that if $e_i > 0$ for some i , then e_i will eventually be driven down to zero by $S - \{i\}$.

Proof Remark 1.4: In a stable 2-country system, if $m_1 d_1 - m_2 = e_1$ and $e_1 < e_2$, then an increase in 1's defensive advantage from d_1 to d_1' allows 1 to retain more economic resources because in the new system 1 can secure its survival if $m_1' d_1' - m_2 = e_1'$. Country 1's readjustment in turn might allow country 2 to cut back its military expenses due to a less external threat. Second, if $m_1 d_1 - m_2 = e_2$ and $e_1 \geq e_2$, then the same reasoning shows that at least country 1 can spend less on military. Finally, if $(m_1 + e_1) d_1 \leq m_2$, then an increase in 1's defense advantage will give 1 the opportunity to retain some

of its economic resources if d_1' is large enough so $(m_1 + e_1)d_1' > m_2$.