RELATIVE GAINS AND THE PATTERN OF INTERNATIONAL COOPERATION

DUNCAN SNIDAL
University of Chicago

Many political situations involve competitions where winning is more important than doing well. In international politics, this relative gains problem is widely argued to be a major impediment to cooperation under anarchy. After discussing why states might seek relative gains, I demonstrate that the hypothesis holds very different implications from those usually presumed. Relative gains do impede cooperation in the two-actor case and provide an important justification for treating international anarchy as a prisoner's dilemma problem; but if the initial absolute gains situation is not a prisoner's dilemma, relative gains seeking is much less consequential. Its significance is even more attenuated with more than two competitors. Relative gains cannot prop up the realist critique of international cooperation theory, but may affect the pattern of cooperation when a small number of states are the most central international actors.

Recent international theorizing continues the long-standing contest between realists who argue that prospects for international cooperation are quite limited and institutionalists who argue that cooperation is possible among states. At the risk of caricature, the relevant strands of this debate can be stated simply. Since Thucydides, realists have proposed that international anarchy makes cooperation difficult because agreements cannot be centrally enforced. In the past decade, institutionalists have found their countervailing case greatly strengthened by analytical results demonstrating, under plausible circumstances, the possibility of decentralized enforcement of cooperation. Recently, realists have replied that this result does not apply to international politics because it is a realm where states seek relative gains, rather than the absolute gains analyzed by institutionalists. I examine this last claim analytically to determine the implications of relative gains for international cooperation.

Relative gains do not provide a sufficient response to the institutionalist claim about cooperation. Only in the very special case of the two-state interaction, with high concern for relative gains and near disregard for absolute gains, is the realist case compelling. For a broad range of more realistic problems, where there are more than two states or where states care about a mixture of absolute and relative gains, the institutionalist case for the possibility of decentralized cooperation remains strong.

My results have a broader relevance for other important social and political settings. Whenever individuals seek status or victory, whenever they engage in contests or tournaments, and whenever goods are "positional" in nature, relative gains are at stake. Since international anarchy, where states seek power or security, is often compared to a Hobbesian state of nature where individuals seek eminence or safety, my results on international cooperation apply equally to contractual theories of the state. Relative gains analy-
sis may also contain insights for understanding certain aspects of bureaucratic or electoral competition. I leave the exploration of these general similarities to the reader, however, and focus instead on relative gains in the specific context of international politics.

I begin with a brief discussion of why realists believe states seek relative gains. Next I examine the strongest part of the realist case concerning the impact of relative gains in interactions involving two states. When two states care only about relative gains, their relations can be modeled as a zero-sum game with no room for cooperation. When states are largely, though not exclusively, motivated by relative gains, their relations are shown to be equivalent to the prisoner's dilemma (PD) regardless of the structure of the underlying absolute gains game. This supports the standard realist construction of international anarchy as PD and suggests why cooperation is problematic. If the initial absolute game is not PD, however, the relative gains PD will be fairly mild and susceptible to decentralized cooperation. But if the absolute gains game is already PD, then incorporating relative gains considerations makes this PD more intense and decentralized cooperation more difficult. In effect, I establish the limited circumstances under which relative gains incentives turn two-actor international situations into either zero-sum games or such intensely conflictual PDs that cooperation is well-nigh impossible.

Relative gains do not matter nearly so much in less restrictive, more realistic circumstances. I develop a model to examine relative gains in PD situations with more than two actors. The general result is that a small increase in the number of actors dramatically decreases the impact of relative gains in impeding cooperation. This effect is augmented by interaction with anything less than a total concern for relative gains. The realist case is thereby shown to be quite weak outside the pure relative gains, tight bipolar world.

Finally, I explore the implications of relative gains for international politics. Although relative gains do not eliminate cooperation, they do predict specific patterns for international cooperation. These predictions provide novel explanations for standard "stylized facts," including why the small exploit the large, why cooperation leads to hegemonic decline, and why particular patterns of cooperation prevail in a bipolar world. Other implications address long-standing disputes in the field, including a surprising finding that relative gains advocates should prefer multipolarity to bipolarity. While the analytical basis for these specific conclusions deserves further refinement, they illustrate the testable propositions that would allow us to evaluate the relative gains hypothesis as an explanation of international behavior.

Thus, the relative gains hypothesis cannot salvage the general pessimism of realism but has interesting implications deserving further careful analytical and empirical investigation. It clearly has important consequences for two-actor situations and, where there are small numbers or important asymmetries among larger numbers, it may modify conclusions obtained from the absolute gains model. In this way the relative gains argument may find an important place in international relations theory.

Why Assume That States Seek Relative Gains?

The assumption that states seek relative gains influences a wide variety of scholarship on international politics. A number of scholars have discussed the inhibiting effect of relative gains on cooperation (Gilpin 1981, 1987; Gowa 1986; Grieco 1988a, 1988b; 1990; Jervis 1988; Kennedy 1987; Krasner 1987; Lake 1984; Larson
Realists argue that the general insecurity of international anarchy leads states to worry not simply about how well they fare themselves (absolute gains) but about how well they fare compared to other states (relative gains). States that gain disproportionately in relations with other states may achieve a superiority that threatens the goals or even the very security of their cooperative partners. Kenneth Waltz summarizes this perspective well:

When faced with the possibility of cooperating for mutual gain, states that feel insecure must ask how the gain will be divided. They are compelled to ask not “Will both of us gain?” but “Who will gain more?” If an expected gain is to be divided, say, in the ratio of two to one, one state may use its disproportionate gain to implement a policy intended to damage or destroy the other. Even the prospect of large absolute gains for both parties does not elicit their cooperation so long as each fears how the other will use its increased capabilities. (1979, 105)

Thus, states are seen to seek relative gains and the inference is drawn that this inhibits cooperation.

The relative gains hypothesis applies to economy as well as security. In part, this is because economic gains can ultimately be transformed into security gains, so that in the long run, security and economics are inseparable. But relative gains thinking occurs independently in economics. Pure mercantilism, where states seek to accumulate specie, entails relative gains aspirations that pit state against state. Similar implications emerge from neo-mercantilism and the new theory of “strategic trade,” with its emphasis on how economies of scale in industries present states with incentives to interfere in trade to gain market shares. This suggests that the pursuit of relative gains can interfere with economic as well as military cooperation.

I do not address the plausibility of relative gains seeking as a description of international behavior, I stipulate it as an assumption. My reason is that I am ambivalent as to how much such aspirations or fears motivate states. I do not believe that relative gains pervade international politics nearly enough to make the strong realist position hold in general. In some circumstances, however, relative gains can help explain certain aspects of international behavior. Rather than debate its merits a priori, I evaluate the relative gains assumption by exploring its implications, which are not yet correctly understood. By accepting the assumption of relative gains maximization, I show that it does not have the general inhibiting effect on international cooperation widely ascribed to it.

Relative gains seeking can inhibit cooperation in two ways. The less important way is by limiting the range of viable cooperative agreements because states will not accept deals that provide disproportionately greater benefits to others. This understanding of relative gains seeking does not clearly distinguish relative from absolute gains. Intense bargaining for greater absolute benefits also leads to a concern with the distribution of joint gains from cooperation. Indeed, in the pure zero-sum case there is no analytic or substantive difference between seeking a greater absolute amount and seeking a greater relative share. More importantly, if distribution is the primary relative gains problem, states can alter the terms of a cooperative agreement or offer side payments until the distribution of gains is sufficiently proportionate. Ironically, this relative gains problem might even facilitate cooperation by narrowing the range of viable cooperative agreements and thereby reducing the absolute gains bargaining problem.

Therefore, I focus on the second, more general way in which relative gains affect international cooperation, namely, by changing states’ incentives. Common interests created by the prospect of joint
absolute gains become increasingly conflictual as relative comparisons are introduced. This alters the strategic structure of interstate relations and thereby decreases the prospects for cooperation. As I shall show, even purely harmonious absolute gains situations between two actors approximate zero-sum conflictual contests when relative gains are important. If room for cooperation remains, agreements are often less viable, since states’ incentives to violate them increase under relative gains. Thus, relative gains decrease states’ interests in cooperation as well as their ability to maintain self-enforcing agreements in anarchy.

It should be noted that the hypothesis of relative gains seeking can be criticized as a misspecification of an argument that could be better expressed in absolute gains terms. When Waltz argues that states do not cooperate when others will gain more than them and threaten their security, he is implicitly describing a trade-off between short-term absolute gains (i.e., immediate payoffs from cooperation) and long-term absolute gains (i.e., security over the long haul). This choice problem is perfectly amenable to absolute gains analysis including effects over time, without recourse to relative gains. Similarly, if states forgo immediate economic benefits to capture market share and score relative gains, their ultimate goal is monopoly profits as a long-run absolute benefit of their short-run sacrifice. Even if competition among states prevents any of them from realizing these long-run absolute benefits, that does not diminish the importance of these incentives in motivating states. Thus, it is possible to substitute a more complicated absolute gains maximization problem for the relative gains hypothesis (Powell 1990).

There are several reasons why it makes sense to investigate implications of the prevailing relative gains hypothesis rather than translate it into absolute gains terms, perhaps states really do care about relative gains independent of these other considerations. To the extent that goals such as prestige, status, or winning motivate states, relative gains are basic elements of their preferences. Second, relative gains may serve as a useful proxy for state goals just as in the realist’s view power may serve as a proxy for states’ more specific goals (Morgenthau 1978). Finally, because realists have failed to produce a model presenting the goals of states in a more explicit and complete way, I am loath to undertake that task for them. Any alternative model I proposed could be rejected as not a fair or true depiction of their arguments. Therefore, I take the relative gains hypothesis as it stands and use a specification for relative gains that is analytically equivalent to Grieco’s (1990, 41).

Relative Gains with Two States

Relative gains considerations convert a wide variety of absolute gains situations into PD. Since PD is the typical depiction of the international anarchy associated with relative gains, this may not seem surprising. But other strategic situations, including chicken and assurance games, are also often discussed in connection with international anarchy. Furthermore, liberals who challenge the realist conception of international anarchy sometimes argue that the circumstances of international politics (or at least some international issues) are best represented as coordination or even harmony games. Choosing among such different analytic representations consequently poses a tough problem at the foundations of international relations theory. The assumption of relative gains provides an escape from this quandary by offering a substantive motivation for the analytic presumption that PD is the archetypical international problem.
To investigate the impact of relative gains, consider a standard two-actor game matrix where each actor faces a decision to cooperate (C) or defect (D) from cooperation. Payoffs are initially defined in absolute terms. If both states cooperate, each receives payoff $M$ from mutual cooperation. If one state cooperates unilaterally, it receives payoff $U$ while the other state receives the free-ride payoff $F$. If neither cooperates, each receives a zero payoff (0), as the normalized payoff associated with noncooperation. Figure 1 depicts these four possible outcomes in a simple game matrix.

Three substantively motivated restrictions on the payoffs focus the analysis on the most relevant subset of the 78 ordinal game situations implied by this two-by-two structure (Hardin 1983; Rapoport and Guyer 1966). First, assume that the game is symmetric (as is implicit in the absence of subscripts on the payoffs). This means that two states are equally well situated to benefit or hurt one another and fashion their cooperative agreement to provide equal absolute gains. Later I shall relax this assumption to examine interactions among multiple states of different sizes and with different relative gains concerns for one another.

Second, assume that states prefer mutual cooperation to mutual defection, so that $M > 0$. This follows from a commonsense understanding of what we mean by cooperation. It is not a significant restriction on the analysis, since it affects only naming conventions for behaviors C and D and not the forms of strategic interdependence allowed. Interchanging C and D for each state converts any game where $0 > M$ into a strategically equivalent game, with only the labels changed, where $M > 0$. Third, assume that states prefer a free ride over unilateral cooperation, so that $F > U$. This fosters individual incentives not to cooperate which, in conjunction with the previous assumption of a collective incentive to cooperate, results in an interesting set of cooperation problems. Since the contrary assumption $U > F$ typically facilitates cooperation, we are effectively limiting the analysis to cases where relative gains have a negative impact on cooperation.

These three restrictions produce six strategic situations spanning the range of cooperation problems as shown in Table 1. One possible game is appropriately described as harmony because both sides have dominant strategies resulting in an equilibrium where each gets its maximal outcome. Two other possibilities correspond to versions of the assurance or stag hunt game, where one of two equilibria is mutually preferred. Although joint cooperation provides the best outcome for both, it is not guaranteed. Fear that the other will fail to cooperate may lead risk-averse actors not to cooperate and thereby to the deficient equilibrium outcome. A fourth possibility is a coordination game, where both states have incentives to coordinate on either of two equilibria but differ over which one to select. Next is chicken where states differ strongly over which equilibrium is preferred, where a Pareto-optimal but nonequilibrium compromise outcome is available to cooperating states and disaster occurs in
Figure 2. Relative Gains Game

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>0, 0</td>
<td>F-U, U-F</td>
</tr>
<tr>
<td>C</td>
<td>U-F, F-U</td>
<td>0,0</td>
</tr>
</tbody>
</table>

gains games. Since \( F > U \), defection (D) is always a dominant strategy for both actors. Thus pure relative gains considerations eliminate all prospects for cooperation in two-actor strategic interactions.

Only in the most extreme case would we expect states to care only about relative gains and totally disregard absolute gains. A more realistic presumption is that states seek relative gains in combination with absolute gains, with the pure absolute and relative gains models seen as limiting cases. This continuum is represented by a weighting parameter \( r \) for the importance of relative gains, and \( (1 - r) \) for the importance of absolute gains, where \( 0 \leq r \leq 1 \). Larger \( r \) means that states care more about relative gains and less about absolute gains. Combining relative and absolute gains considerations in this way leads to the payoff matrix shown in Figure 3.12

This framework allows us to investigate the consequences of increased concern for relative versus absolute gains for the game structure. Recall the impact of relative gains in Figure 2. Relative gains provide a negative payoff for unilateral cooperation (since \( F > U \)), a positive payoff for free-riding, and zero payoff where states gain equally through either mutual coopera-

Figure 3. Mixture of Absolute and Relative Gains Games

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>0,0</td>
<td>F*- = F-rU, U* = U-rF</td>
</tr>
<tr>
<td>C</td>
<td>U* = U-rF, F* = F-rU</td>
<td>M* = (1-r)M, M* = (1-r)M</td>
</tr>
</tbody>
</table>
### Table 1. Six Representative Cooperation Problems

<table>
<thead>
<tr>
<th>Preference Ordering for Each Side</th>
<th>Ordinal 2 × 2 Game</th>
<th>Popular Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D</td>
<td>C</td>
</tr>
<tr>
<td><strong>M &gt; F &gt; U &gt; O</strong></td>
<td>D</td>
<td>![1,1]</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>![2,3]</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>![2,2]</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>![1,3]</td>
</tr>
<tr>
<td><strong>M &gt; O &gt; F &gt; U</strong></td>
<td>D</td>
<td>![3,3]</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>![1,2]</td>
</tr>
<tr>
<td><strong>F &gt; U &gt; M &gt; O</strong></td>
<td>D</td>
<td>![1,1]</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>![3,4]</td>
</tr>
<tr>
<td><strong>F &gt; M &gt; U &gt; O</strong></td>
<td>D</td>
<td>![1,1]</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>![2,4]</td>
</tr>
<tr>
<td><strong>F &gt; M &gt; O &gt; U</strong></td>
<td>D</td>
<td>![2,2]</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>![1,4]</td>
</tr>
</tbody>
</table>

*Note:* The games are derived under assumptions of symmetry, that mutual cooperation is preferred to mutual defection, and that free-riding is preferred to unilateral cooperation. Payoffs are ordinal with higher numbers representing more preferred outcomes. They are not normalized to have mutual defection equal to zero as in the text. Nash equilibria are circled.
tion or mutual defection. In addition, increased emphasis on relative gains means that absolute payoffs are less important, so that the value of cooperation itself drops. These two effects produce transformed $U^*$, $F^*$, and $M^*$ payoffs (where the asterisk represents the combination of absolute and relative gains considerations) while not affecting the normalized noncooperation payoff of 0. For example, increasing $r$ decreases $M^*$ unconditionally and decreases $U^*$ provided $F > 0$. In turn, changes in these values change the rank order of states' preferences and thereby transform the game structure.

The transformation of the harmony game illustrates how relative gains calculations change game structures. The initial preference ordering for each state is $M > F > U > 0$. As relative gains considerations become more important, the first three payoffs in this ordering decrease but at different rates. When $U > M - F$, as in the left half of Figure 4, the harmony ordering is maintained until $r > (M - F)/(M - U)$. Beyond this, the preference orderings become $F^* > M^* > U^* > 0$, and the structure of the game is changed to chicken (see Table 1). If relative gains concerns increase further, so that $r > U/F$, the individual orderings become $F^* > M^* > 0 > U^*$ and structure of the game converts to PD. This structure persists until $r = 1$ and the pure relative gains, zero-sum game of Figure 2 pertains. Conversely, when $U < M - F$, as in the right half of Figure 4, the harmony ordering is maintained until $r > U/F$, at which point the structure of the game is transformed to assurance I. As $r$ increases further, the structure of the game converts to PD once $r > (M - F)/(M - U)$. Again, this structure persists until $r = 1$.13

Only one scenario is possible for each of the other five symmetric games, as
International Cooperation

Figure 5. Relative Gains Transformation of Absolute Gains Games into Prisoners’ Dilemmas

<table>
<thead>
<tr>
<th>Original Game</th>
<th>Transformed Games as r increases.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assurance I</strong></td>
<td>Assurance I PD</td>
</tr>
<tr>
<td>M&gt;F&gt;O&gt;U</td>
<td>M&gt;F M-U</td>
</tr>
<tr>
<td><strong>Assurance II</strong></td>
<td>Assurance II Assurance I PD</td>
</tr>
<tr>
<td>M&gt;O&gt;F&gt;U</td>
<td>E U M-F M-U</td>
</tr>
<tr>
<td><strong>Coordination</strong></td>
<td>Coordination Chicken PD</td>
</tr>
<tr>
<td>F&gt;U&gt;M&gt;O</td>
<td>M-U M-F U F</td>
</tr>
<tr>
<td><strong>Chicken</strong></td>
<td>Chicken PD</td>
</tr>
<tr>
<td>F&gt;M&gt;U&gt;O</td>
<td>U F</td>
</tr>
<tr>
<td><strong>Prisoners’ Dilemma</strong></td>
<td>PD</td>
</tr>
<tr>
<td>F&gt;M&gt;O&gt;U</td>
<td>Pure Absolute Gains increasing r Pure Relative Gains (zero-sum)</td>
</tr>
</tbody>
</table>

Note: Intervals for $r$ (e.g., $F/U \leq r \leq (M - F)/(M - U)$) are not directly comparable across cases because the stipulated orders of $M$, $F$, $U$, and $0$ are not the same. Prisoners’ dilemmas become more intense toward the right.
shown in Figure 5. Assurance I is transformed into PD once the weighting of relative gains exceeds \((M - F)/(M - U)\). Assurance II passes through an intermediate phase, first being transformed into assurance I when \(r > R/U\) and then into PD once \(r > (M - F)/(M - U)\). The coordination game passes through an intermediate phase of chicken before becoming PD as \(r\) increases. Chicken is transformed directly into PD once \(r > U/F\). Finally, PD maintains its same structure for all relevant values of \(r\). However, this PD structure becomes more intense with increasing \(r\), since the temptation to free-ride increases, the consequences of unilateral cooperation are more severe, and the advantages of mutual cooperation over mutual defection decrease. In all situations, the limiting case where only relative gains matter (i.e., \(r = 1\)) is the zero-sum game where both sides have a dominant strategy not to cooperate.

This tendency to convert absolute gains situations into PD can be summarized in terms of the impact of relative gains motives on states' payoffs. Since \(F > U\), \(F^* = F - rU\) must become positive as \(r\) increases toward 1. Therefore, free-riding is eventually preferred to mutual cooperation (i.e., \(F^* > M^*\)), since \(M^* = (1 - r)M\) becomes a progressively smaller positive payoff as relative gains become more important. Until \(r = 1\), however, mutual cooperation provides a greater payoff than the normalized 0 payoff from mutual defection (i.e., \(M^* > 0\)). Finally, relative gains pressures necessarily make \(U^* = U - rF\) negative and the least preferred payoff as \(r\) increases (i.e., \(0 > U^*\)). Thus, as \(r\) increases, the preference orderings of states are eventually transformed to \(F^* > M^* > 0 > U^*\), which defines PD. In the limiting case where \(r = 1\), the game becomes zero-sum with \(F^* > M^* = 0 > U^*\) and \(F^* = -U^*\). Whatever the initial absolute gains circumstance, relative considerations augment incentives for states not to cooperate for familiar reasons associated with PD and zero-sum games.

Thus, we see how the substantive intuition of realism that states care about relative gains maps into its implicit analytic presumption that international anarchy can be characterized as a PD. Relative gains calculations transform each of the various absolute gains circumstances presented in Table 1 into PD. This makes cooperation problematic even when absolute gains conditions are congenial as in harmony or assurance. The greater the concern for relative gains, the more intense is the resulting PD, until \(r = 1\), when all two-actor interactions become zero-sum. In these circumstances, realists argue, cooperation is much more difficult or even impossible.

Prospects for Cooperation in a Two-Actor Relative Gains World

How much do relative gains considerations impede cooperation in a two-actor world? When states are exclusively relative gains seekers, the two-actor world is zero-sum and cooperation is impossible. Because such an extreme assumption is rarely warranted, I shall briefly examine the impact of more realistic, intermediate levels of relative gains aspirations. First, I consider how mixtures of relative and absolute considerations affect cooperation within PD. Second, I evaluate the tendency for relative gains aspirations to transform non-PD absolute gains games into PD. Finally, I measure the intensity of the resulting PDs. The conclusion is that moderate levels of relative gains reinforce the characterization of international politics as PD but that only quite high levels of \(r\) produce intense PDs from other absolute gains situations. First, what is the differential impact of low, medium, and high levels of relative gains ambitions in PD? If small degrees of relative gains make any PD very intense, the deleterious implications for coopera-
International Cooperation

Figure 6. The Relationship between $\phi$ and $r$ for Three Prisoners’ Dilemmas of Increasing Severity

<table>
<thead>
<tr>
<th>$\phi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>0.8</td>
</tr>
<tr>
<td>0.6</td>
</tr>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.2</td>
</tr>
</tbody>
</table>

{2,1,0 - 20}

{2,1,0 - 1}

{2,1,0 - 5}

Note: Numbers in parentheses correspond to $\{F, M, O, U\}$.

Changes in the minimum discount factor ($0 \leq \phi < 1$) required to support cooperation provide a useful measure of the impact of relative gains in inhibiting cooperation in the PD. The discount factor measures the extent to which a state values future benefits relative to current benefits. For example, a discount factor of .8 means that a state values a unit of benefit in the next period as worth only .8 units in the current period and, generally, values a unit of benefit $p$ periods in the future at only $.8^p$ units today. Since decentralized cooperation in PD can be supported by ongoing future incentives offered by mutual cooperation (e.g., through joint choice of tit-for-tat strategies), it is more likely to be stable when a lower discount factor is required of states. The reason is that smaller future benefits of continuing cooperation are then sufficient to outweigh larger immediate gains from non-cooperation (Axelrod 1984). Minimum $\phi$ is the lowest discount factor for states at which cooperation is stable; increases in minimum $\phi$ indicate the deleterious impact of relative gains on cooperation. A related measure used below is the increase in minimum discount factor induced by a given level of relative gains seeking as a proportion of the total change in the discount factor caused by a shift from pure absolute gains to pure relative gains seeking.18

Figure 6 shows that cooperation in PD is most greatly affected when relative
gains concerns increase from low levels (i.e., $\frac{\partial \phi}{\partial r} > 0$ and $\frac{\partial^2 \phi}{\partial r^2} < 0$). The top curve clearly illustrates this concave relation between $r$ and $\phi$. Here $r$ has had nearly 80% of its impact on $\phi$ by the time $r = .25$, and over 90% by the time $r = .5$. This is an extreme case, however, where the difference between unilateral cooperation ($U$) and no cooperation ($O$) is 20 times as great as the difference between cooperation ($M$) and no cooperation (i.e., $[F, M, 0, U] = [2, 1, 0, -20]$). In general, low levels of $r$ have their greatest impact when $U$ is low compared to the other payoffs. The bottom curve presents a possibly more typical PD game based on the “standard” preference ordering (i.e., $[4, 3, 2, 1]$ normalized to $[2, 1, 0, -1]$). Here the impact of low levels of relative gains on $\phi$ is much more modest. Nevertheless, the proportional impact of low levels of relative gains is greater at lower levels of $r$ with 33% of their impact on $\phi$ occurring for levels of $r = .25$, and 60% of their impact occurring when $r = .5$. The middle curve shows similar results for an intermediate case $[2, 1, 0, -5]$. These results indicate that small degrees of relative gains motivations are important though not necessarily decisive, in impeding cooperation in PD games.

The second issue is how quickly relative gains transform other absolute games into PD. Since $F$, $M$, $0$, and $U$ can vary widely within the minimal constraints imposed on them, it is difficult to generalize as to the level of relative gains pressures necessary to convert various absolute gains games into PD. Very low levels of $r$ are sufficient to transform different situations into PD whenever the payoff from unilateral cooperation ($U$) is significantly lower than the gains from free-riding ($F$). Conversely, when unilateral cooperation is almost as beneficial as free-riding (i.e., $U$ is close to $F$) games become PD only when $r$ is close to unity. And where mutual cooperation is preferred to free-riding, low levels of relative gains considerations inhibit cooperation only if the difference (i.e., $M - F$) is small. Most importantly, it is obviously easy to concoct particular examples where small or large doses of relative gains are needed to have an impact.

A way to appreciate the impact of relative gains is in terms of the “standard” two-by-two game preferences with the best outcome equal to four and the worst outcome equal to one. These interval-level payoffs are normalized so that mutual noncooperation is equal to zero. In this case, assurance I and chicken turn into PD when $r > 1/3$; harmony turns into PD when $r > 1/2$ and assurance II and coordination turn into PD when $r > 2/3$. The PD, of course, remains PD throughout but becomes more intense with increasing $r$. We can conclude that under the typical specification of two-by-two game payoffs, a moderate (i.e., $1/3$) to high (i.e., $2/3$) level of $r$ is necessary to transform non-PD games into PD.

An important caveat follows: PD results significantly overstate the deleterious impact of relative gains on cooperation in other absolute gains circumstances. The reason is that the initial impact of relative gains is used up in first converting these other games to PD. Only then can increasing relative gains pressures make the resulting PD progressively more intense. Figure 7 shows these differential results for the standard preference rankings described. Consider a comparison of the minimal discount factor ($\phi$) required to support cooperation in various games when $r = .5$. Cooperation in PD requires $\phi > .8$, whereas chicken requires $\phi > .6$ and assurance I requires $\phi > .33$. The cooperative equilibrium in harmony is stable for any positive discount factor when $r = .5$, since it is at this point that it has just converted to PD. Assurance II possesses a stable cooperative outcome for $r < 2/3$ and is not greatly affected by relative gains considerations of this magnitude. Indeed, except for
Figure 7. The Relationship between $\phi$ and $r$ for Six Standard Games

![Diagram showing the relationship between $\phi$ and $r$ for six standard games.]

A minor exception in the coordination game, the minimum discount factor ($\phi$) required for a stable cooperative equilibrium is higher for PD than for the other games until $r = 1$. Therefore, relative gains findings for PD significantly overstate their impact on other initial absolute gains games. Relative gains make other games PD, but not especially intense ones.

Thus, the intuition of realism is confirmed but qualified whenever there are substantial relative gains concerns between two states. Although relative gains transform other absolute gains situations into PD, PD results significantly overstate the impact of relative gains for these other games. Within PD, the impact of increasing relative gains is greatest at low levels of $r$ and increases at a decreasing rate until all prospects for cooperation are eliminated at $r = 1$. This lends some credence to the realist conclusion that cooperation is more difficult when states are relative gains seekers and are in absolute gains PD situations.

Because this realist pessimism is predicated on the two-actor case, it cannot be uncritically transferred to the multiactor world—as it has been—without careful scrutiny. I now stipulate that the initial absolute gains situation is PD—the most
favorable assumption for the relative gains case—and examine the further limitations to the realist position when there are more than two states and they care about both relative and absolute gains.

Relative Gains with More Than Two States

A separate paper analyzes cooperation among different numbers of identical states that care only about relative gains (Snidal 1991). It shows that relative gains do not affect prospects for cooperation whenever the number of states \( n \) is large. Because those results depend on large \( n \), however, that analysis is inconclusive as to the effect of relative gains involving small numbers of states. It also assumes symmetry (in that states are of equal importance) and does not allow for mixtures of relative and absolute gains objectives.

I explore here the impact of relative gains among small numbers of states, especially when they are not all identical. The logic is to examine the conditions under which cooperation is a stable equilibrium outcome in an iterated relative gains PD, using the minimum discount factor \( (\phi) \) as an indicator of the difficulty of cooperation. This equilibrium is examined to see how it is affected by variations in overall concerns for relative gains as well as differential concerns with relative gains vis-à-vis particular other states. Because the analysis is generalized to include states of different sizes, I shall first examine how the costs and benefits of cooperation are distributed among states of different sizes.

Why Cooperative Gains Are Equally Distributed between States

The central result derived is that small and large states share equally in costs and benefits of international cooperation; that is, when Canada and the United States cooperate, each bears equal costs and earns equal benefits even though Canada is roughly one-tenth as populous as the United States. This seemingly surprising conclusion follows from an assumption of constant returns to scale: cooperating with \( q \) states of equal size provides a state with \( q \) times the cooperative benefits of cooperating with one state. Similarly, cooperating with a state that is \( q \) times as large as another provides \( q \) times as many benefits. When such conditions apply, different-sized states gain equally from cooperation.

Constant returns to scale is a reasonable, though imperfect, assumption for analyzing international cooperation. Cooperative returns are surely increasing in some range, playing an important role in the formation of the nation-state itself, as well as in the development of any international division of labor in either economic or security affairs. Returns are probably decreasing at some later stage, at least for states that are large and well integrated into the international system. But for an important range of intermediate levels of international cooperation, constant returns to scale is a useful initial approximation.22

To demonstrate that constant returns imply an equal division of costs and benefits between states, consider different-sized states as composed of different integral numbers of equal units. These units are the accounting measures for the relevant attributes constituting the “size” of a state for international cooperation. Because units are identical, cooperation between any two of them entails identical costs \( (c) \) and benefits \( (b) \) for each. Constant returns to scale means that the costs and benefits of any dyadic interaction are independent of other cooperative interactions in which either of those two units is engaged. Thus, the total net benefit to any unit from cooperation equals \( b - c \) times the number of cooperative dyads to which it belongs. The total collective
International Cooperation

benefit summed over a group of $S$ units all cooperating with one another equals $b - c$ times twice the number of dyads in the population or $[(b - c)S!/((S - 2)!)].$

If $S$ represents the number of units in the international system, then state sovereignty is a partition of the system into $n$ mutually exclusive and exhaustive subsets $\{s_1, \ldots, s_n\}$ where $s_i$ is the size of the $i$th state, individual states may be of different sizes, and $\Sigma s_i = S$. By expanding the measure of collective cooperative gains in terms of this sovereignty partition and rearranging terms, we obtain

$$(b - c) \frac{S!}{(S - 2)!} = (b - c) \sum_{i=1}^{n} \frac{s_i!}{(s_i - 1)!} + (b - c) \sum_{i=1}^{n} s_i \sum_{j \neq i} s_j.$$ 

The left-hand side represents total benefits from global cooperation, while the right-hand side terms partition these into benefits from domestic and international cooperation, respectively. The first term represents the sum of domestic cooperative benefits within each of $n$ states (i.e., the aggregate cooperative benefits among the $s_i$ units constituting a particular state). This domestic cooperation is taken as unproblematic from an international perspective and will not be discussed here. The second term on the right-hand side represents the benefits of complete international cooperation. Each state $i$ receives $s_i s_j (b - c)$ from cooperation with state $j$, while state $j$ simultaneously receives $s_j s_i (b - c)$ from cooperating with state $i$. Thus, the assumption of constant returns to scale implies that the gains of international cooperation between two states are proportional to the product of their "sizes" and are equally divided between the two states. Although I use the specific form $s_i s_j (b - c)$ below, the conclusion concerning the equality of the gains is most important in the general argument.

An example is cooperation between Canada and the United States. On the one hand, the United States is 10 times the size of Canada, so each Canadian unit benefits from cooperation with 10 times as many U.S. units as does each U.S. unit with Canadian units. On the other hand, 10 times as many U.S. units benefit from cooperation. Since the aggregate national gain from bilateral cooperation is the sum of the gains of their respective units, it is straightforward to see that these sums are equal for the two states. The key assumption here is of constant returns to scale. The Canadian units represent the 101st-110th cooperative partners for the U.S. units, whereas the U.S. units represent the 11th-110th partners for Canadian units. If cooperation with the 11th partner provides more benefits than cooperation with the 101st partner (i.e., declining returns), then aggregate Canadian gains will exceed U.S. gains from cooperation.

Under a constant returns assumption, gains from cooperation are proportional to the size of the involved states and are shared equally between them. In absolute terms, states have the same interest in cooperation regardless of their respective sizes. Because the potential benefits of international versus domestic cooperation are proportionately greater for small states, asymmetric interdependence places them in a more vulnerable bargaining position. I do not address such considerations except to show why relative gains create incentives for larger states not to take advantage of this bargaining strength and, if anything, to offer sweeter deals to smaller states. In terms of relative position (as measured by absolute gaps between states), cooperation does not lead to relative gains. But relative considerations do provide additional incentive to break agreements, since states seek not only to do well for themselves but also to do better than others.
The Limited Impact of Relative Gains in Multilateral Settings

Now we can examine relative gains maximization among a set of states \( s_1, \ldots, s_n \), where \( s_i \) represents the size of state \( i \). As I have shown, cooperation between two states leads to an equal payoff \( s_i s_j (b - c) \) for each. This is an absolute payoff, however, and we want to consider states that worry about relative gains as well. Let the parameter \( r \) (with \( 0 \leq r \leq 1 \)) represent the weight states place on relative gains and \( (1 - r) \) the weight of absolute gains in their overall evaluation of outcomes. When \( r = 1 \), we have the special case where states care exclusively about relative gains; when \( r = 0 \), they care only about absolute gains. Thus variations in \( r \) allows us to examine the impact of relative gains considerations on cooperation.25

We need to address the possibility that states are concerned with relative gains compared to specific other states. Certain states are more threatening for geopolitical reasons, including proximity or competition for key resources, or because of their seemingly aggressive character or ideological differences or a history of grievances between the two states. Or a state may be inherently more threatening simply because it has greater capabilities. Conversely, another state is typically less threatening when it is far away, has no reason to be hostile, or is small. To incorporate different evaluations of different states, let every state have a set of weights \( w_{il}, \ldots, w_{in} \), where \( 0 \leq w_{ij} \leq 1 \) indicates the emphasis state \( i \) places on state \( j \)'s performance in evaluating its relative gains position.

Assume that states distribute their relative gains concerns across other states so that \( \sum w_{ij} = 1 \). This restriction follows straightforwardly from a standard intuition of international balancing: it is at least as dangerous to suffer a unilateral loss in a world with fewer actors as in a world with more actors.26 The reason is that more actors enhance the possibilities of protecting oneself through forming coalitions; and, generally, the less well united one's potential enemies, the safer one is. For example, the United States would be less adversely affected (or at least no more affected) by a drop in its power if the Soviet Union had first disintegrated into its separate republics than otherwise. This assumption has the substantive implication that states are not paranoid in the sense of magnifying relative gains losses versus other states without regard to their importance for overall power or security considerations. Conversely, states cannot be deluded by artificially inflating their relative gains performance through comparisons to strategically insignificant states.

Denoting state \( i \)'s absolute payoff from international interactions as \( P_{ia} \), its payoff incorporating relative gains concerns (defined as differences between its absolute payoff and the absolute payoff of other states) is

\[
P_{ir} = (1 - r)P_{ia} + r \sum_{j=1}^{n} w_{ij} (P_{ia} - P_{ja}).
\]

Index \( r \) reflects state \( i \)'s degree of concern with relative gains. The first term on the right-hand side indicates the importance of its own absolute gains, and the second term its evaluation of relative gains versus every other state. This is the objective function that state \( i \) seeks to maximize.27

To investigate the impact of relative gains on cooperation, consider the circumstances under which state \( i \) would maintain a cooperative agreement with state \( k \). Here cooperation involves a dichotomous choice to cooperate (by providing the other a benefit at a cost to oneself) or not-cooperate at each play of a repeated interaction. Repeated play situations are of primary interest because self-
enforcing cooperation requires that the incentives provided by future cooperation be sufficient to maintain ongoing cooperation against current incentive to not-cooperate. For simplicity, states consider only two supergame strategies, tit-for-tat starting with cooperation or never cooperate. Third-party states are assumed to maintain their current behavior and do not react to the outcome between i and k. The possibility for cooperation then depends on whether the joint choice of tit-for-tat strategies is an equilibrium or whether states have an incentive to not-cooperate (never cooperate) when others cooperate (tit-for-tat).28

If both states choose tit-for-tat, then, with constant returns to scale, each receives \((b - c) s_i s_k\) on every play of the game. With a discount factor of \(\phi\) the current value of this stream of absolute gains is \(s_i s_k (b - c) / (1 - \phi)\). Incorporating relative gains considerations, the payoff to state i from a joint tit-for-tat strategy choice is

\[
P_{ir} + \frac{(1 - r) s_i s_k (b - c)}{1 - \phi} + \frac{r s_i s_k}{1 - \phi} \sum_{j \neq k} w_{ij}.
\]

The stability of cooperation depends on whether an individual state i does better by breaking the agreement for immediate gains at the expense of destroying the longer-run cooperative agreement. If state i defects, it receives a first-round payoff of \(s_i s_k b\) from its free ride on k's unilateral cooperation. This ends bilateral cooperation, since k will reciprocate in the next round and no further benefits will be received from the interaction. Meanwhile, state k incurs a one-period loss of \(s_i s_k c\) from unilateral cooperation. After this loss, state k will cease cooperation and realizes no further costs or benefits from the dyad. Again, these are all absolute gains payoffs, and state i's overall evaluation—including relative gains considerations—can be seen in the light of equation 1 to be

\[
P_{ir} + (1 - r) s_i s_k b + r s_i s_k b \sum_{j \neq k} w_{ij} + r s_i s_k (b + c) w_{ik}.
\]

The first term is again the value of the preexisting situation, while the second term reflects the absolute gains from a free ride on state k's unilateral cooperation for one period. The third term represents the relative advantage achieved over third-party states through this free ride. The final term is i's relative gain over k, due not only to the value of i's free ride but also to the loss sustained by k through unilateral cooperation.

The stability of cooperation between i and k depends on whether the value of continuing cooperation in equation 2 exceeds the value of defection in equation 3. This will be the case if

\[
\phi > \phi_{rw} = \frac{c + r w_{ik} b}{b + r w_{ik} c},
\]

where \(\phi_{rw}\) is the minimum discount factor that will support cooperation when state i places an overall weight of \(r\) on relative gains and a specific relative gains weight of \(w_{ik}\) on state k. Note that neither the absolute nor relative sizes of two interacting states directly affect their propensity to cooperate. Insofar as size affects relative gains weights (e.g., \(s_k\) partly determines \(w_{ik}\)), however, it indirectly makes
cooperation more difficult among larger states and dampens the willingness of smaller states to cooperate with larger states. I pursue possible implications of this below.

The key factors determining the impact of relative gains are $r$ and $w_{ik}$. If either is zero, then equation 4 reduces to $\phi_{rw} = c/b$, the condition for cooperation when states care only about absolute gains ($\phi_a$). That is, if state $i$ either does not care about relative gains in general ($r = 0$) or its relative gains concerns do not involve state $k$ in particular ($w_{ik} = 0$), then cooperation is not impeded. At the other extreme, cooperation is impossible if $r$ and $w_{ik}$ are both unity since equation 4 reduces to the impermissible $\phi > \phi_{rw} = 1$. That is, if a state cares only about relative gains ($r = 1$) and evaluates them only with respect to one other state ($w_{ik} = 1$), there is no room for cooperation with that state. This is unsurprising, since it reduces the interaction to a two-actor pure relative gains situation that is strictly zero-sum, as shown earlier. Such a world is doubly unrealistic, since it assumes both that states do not care at all about absolute gains and that they inhabit a bipolar system so tight that no regard is paid to third parties.

Understanding the impact of relative gains in the multilateral setting requires analysis of the joint impact of $r$ and $w_{ik}$. As in the two-actor case, the impact of increasing $r$ is greatest at low levels, with positive but decreasing additional impact as $r$ increases. The same is true for $w_{ik}$ (i.e., $\partial^2 \phi / \partial w^2 > 0$ and $\partial^2 \phi / \partial w^2 < 0$). Although this suggests that low levels of concern for relative gains have a significant impact on cooperation, as shown for the two-state case above, the interactive relation of these two factors decreases that impact dramatically. Figure 8 shows this relation for $\phi_a = .5$. The axes represent different levels of $r$ and $w_{ik}$ while the rectangular hyperboles are isograms for equal levels of $\phi_{rw}$ required to support cooperation. The origin is the point where there are no relative gains considerations so that $\phi_{rw} = \phi_a$. Finally, the horizontal axis indicates the cases of bipolarity, tri-party, and classical balance of power involving two, three, and five states, respectively.

Both $r$ and $w_{ik}$ must be large for relative gains to matter. Figure 8 shows that if either $r$ or $w_{ik}$ is small, then $\phi_{rw}$ is not substantially larger than $\phi_a$. More importantly, unless both $r$ and $w_{ik}$ are large, the impact on $\phi$ is at most moderate. Consider a tripolar system where relative and absolute gains are weighted equally, so that $r = w_{ik} = .5$. Relative gains considerations increase $\phi$ from an initial absolute gains $\phi_a = .5$ to $\phi_{rw} = .67$. This increase is substantially less than the extreme relative gains case, with $\phi$ increasing only one-third as much. The increase in $\phi$ is slightly greater for higher values of $\phi_a$, but relative gains considerations still do not necessarily impede cooperation. Thus, the tripolar case already indicates a very different situation from the pure bipolar relative gains situation. Whenever there are more than three significant states...
Table 2. Percentage Impact of Relative Gains under Different Combinations of \( r \) and \( w \)

<table>
<thead>
<tr>
<th>System Type ((n, w))</th>
<th>( \phi_a = .5 )</th>
<th>( \phi_a = .8 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.25</td>
<td>.50</td>
</tr>
<tr>
<td>Bipolar ((n = 2, w = 1))</td>
<td>0</td>
<td>33</td>
</tr>
<tr>
<td>Tripolar ((n = 3, w = .5))</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Balance of power ((n = 5, w = .25))</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>10 countries ((b = 10, w = .11))</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>20 countries ((n = 20, w = .05))</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Large (n \to \infty, w \to 0)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

or relative gains are weighted less heavily, the impact of relative gains is even smaller, as can be seen clearly in Figure 8.

Table 2 highlights this relationship numerically for this case and also for \( \phi_a = .8 \). The bipolar system with \( r = 1 \) represents the case where relative gains have 100% of their impact and fully inhibit cooperation. With large numbers of relevant actors or \( r = 0 \) (corresponding to the vertical and horizontal axes of Figure 8, respectively), relative gains have no impact (0%). Intermediate cases show the percentage of relative gains impact under the stipulated circumstances.

The impact of relative gains drops off rapidly whenever \( r \) and \( w \) are not both high. Again, the tripolar case is most dramatic. Adding a third actor to the pure bipolar relative gains world is equivalent to cutting the concern for relative gains in half (e.g., \( n = 3, r = 1 \) is equivalent to \( n = 2, r = .5 \)) and reduces the impact of relative gains by about 40%. When both \( n = 3 \) and \( r = .5 \), the impact of relative gains is reduced by roughly two-thirds. Similarly, a move to a balance-of-power system (even with \( r = 1 \)) is equivalent to a reduction of relative gains concerns by 75% and reduces their impact by two-thirds. In general, whenever \( n > 2 \) and \( r < .5 \), relative gains have no more than 40% of their potential impact, regardless of the initial value of \( \phi_a \). The drop-off is even greater for lower levels of \( r \) and \( w \).

Thus, the relative gains argument cannot provide a decisive response to the institutionalist claim that decentralized cooperation is possible under anarchy. Relative gains can save the realist case only in the two-actor world and perhaps demonstrate that institutionalists underestimate the difficulty of cooperation in other very-small-\(n\) cases. But these are much weaker claims than realists have made in uncritically transferring relative gains arguments from the two-actor world to international politics more generally.

### Implications of Relative Gains for Contemporary International Relations Theory

Although the general claim that relative gains prevent international cooperation is not correct, some potentially interesting implications follow from the assumption. As I have shown, relative gains have their greatest impact when the number of states is small or (equivalently in terms of the model) there are asymmetries among them. I shall informally sketch out some plausible explanations that relative gains may provide for key aspects of the interaction between large and small states, hegemonic cooperation and decline, cooperation patterns in a bipolar system, and the possibility of increasing cooperation under multipolarity.
Why Do the Small Exploit the Large?

A common claim about international politics is that small states fare better than large states from their interactions. Examples include unequal burden sharing in military alliances (Olson and Zeckhauser 1966) and the need for some large country to absorb the costs of leading the international economy (Kindleberger 1973). The standard explanation for this putative phenomenon is that international cooperation is a public goods problem where large actors make the group privileged by unilaterally providing the collective good (Olson 1965). Difficulties with this account include such questions as whether the relevant international goods are truly public and why relative decline of the largest state does not always result in the collapse of public goods provision (Keohane 1984; Snidal 1985b). These objections are not necessarily fatal, but they require complicated supplementary arguments regarding the role of international institutions in promoting and maintaining cooperation.

The relative gains explanation is simpler and arguably more elegant. Although I did not assume it earlier, it is reasonable to believe that states are warier of larger states with regard to relative gains. Thus, for any pair of states, the smaller state will be more concerned with the relative gains consequences of their interaction (i.e., $wi > wj$ if $si < sj$, ceteris paribus). The larger state may overcome the smaller state's greater reluctance to cooperate by offering it more than an equal share of the benefits. It is in the large state's interest to do so because it prefers an unequal cooperative arrangement to no cooperation. Therefore, an asymmetric distribution of absolute gains may be a requisite for striking cooperative agreements among different-sized states concerned about relative gains.

Hegemonic Cooperation and Decline

Cooperative arrangements favoring smaller states contribute to relative hegemonic decline. As the unequal distribution of benefits in favor of smaller states helps them catch up to the hegemonic actor, it also lowers the relative gains weight they place on the hegemonic actor. At the same time, declining relative preponderance increases the hegemonic state's concern for relative gains with other states, especially any rising challengers. The net result is increasing pressure from the largest actor to change the prevailing system to gain a greater share of cooperative benefits.

This relative gains argument may better explain changes in economic relations among Western states than in security relations where the public goods nature of defense spending (especially deterrence) is more compelling. Shifting concern over foreign trade and investment is one indicator of perceived changes in relative advantage. Whereas in the 1950s and 1960s Europe, Canada, and the Third World complained of U.S. dominance in trade and investment, in the 1970s and 1980s it was the United States that worried about foreign—especially Japanese—relative advantage. The United States now actively seeks to alter international trading rules in its favor whereas in the early postwar period it accepted special exceptions for European and less-developed states.

Cooperation Patterns in a Loose Bipolar World

The hegemony argument overlooks the obvious fact that the postwar international system combined two superpowers with a handful of secondary powers and a multitude of small states. As a first approximation, consider the relative gains consequences in a system with...
International Cooperation

two great powers and many small ones. The large states weight each other heavily on relative gains and weight the small states barely at all. The many small states weight the great powers heavily and each other not very much at all. (Again, I set aside geopolitical, historical, and other factors that affect this pattern.) Therefore, small states find it easier to cooperate with each other than with large states. Large states find it difficult to cooperate with each other, but their willingness to cooperate with smaller states is not impeded by relative gains. Because small states are reluctant to cooperate with them, the great powers may offer favorable terms to small states as noted above. Indeed, competition between them for cooperative relations with small states seems likely. The result is the relative decline of the superpowers and therefore increased possibilities for cooperation between them.

This approximation to bipolarity explains many stylized facts of the postwar period. The superpowers found it very difficult to cooperate with one another. They competed to establish good relations with small states, especially in the Third World, where spheres of influence were more fluid. Cooperation among smaller states was evidenced in the early successes of the European Community. The greatest anomaly is perhaps relations among Third World states, where a number of major cooperative initiatives, including the Andean Pact, the Association of Southeast Asian Nations (ASEAN), non-alignment or the Organization of African Unity met limited success. Only in the late 1960s did Third World cooperation emerge in forums such as the Law of the Sea and the United Nations Conference on Trade and Development (UNCTAD), and some of this was more rhetorical than real. Finally, if the relative gains hypothesis is correct, it helps explain how competition between the two superpowers led to their mutual decline and improved prospects for cooperation between them. (See Snidal 1991 for a related discussion of the instability of bipolarity under relative gains.)

Multipolarity Versus Bipolarity

Some realists argue that bipolarity is preferable to multipolarity because states care about relative gains. Waltz, for example, proposes that it is easier to keep track of relative capabilities in a bipolar world and that the resulting reduction in uncertainty increases stability (1979, 168). However, the preceding analysis shows why it is less necessary to keep track of relative gains in a multipolar world. Because rational state behavior is less affected by relative gains, cooperation is easier under multipolarity. Therefore, realists who premise their arguments on relative gains should prefer multipolarity over bipolarity.34

This contrasts sharply with standard absolute gains arguments that increasing the number of states limits cooperation. Increasing n impedes retaliation against noncooperators whenever states cannot perfectly discriminate their behavior with respect to particular other states. It therefore limits the possibilities for decentralized enforcement of cooperative agreements. These problems have been set aside in the current analysis by treating interactions as dyadic, although the broader n-actor environment is crucial to each state's behavior in the dyad. Limiting the ability of states to differentiate their behavior across dyads also makes relative gains cooperation more difficult under increasing n. When discrimination is possible, however, increasing n has the opposite impact of promoting cooperations in the relative gains world.

It is premature to conclude that recent trends toward multipolarity have facilitated international cooperation. To be sure, there has been a short-run blossoming of cooperative East–West relations;
and it is possible to point to recent successes in intra-West relations. However, this follows a period of intense rivalry between the superpowers and is accompanied by continuing tensions over the management of the Western economy. In brief, there is insufficient evidence to support the claim that multipolarity has increased cooperation. What we can say is that relative gains arguments do not support claims that the increasing importance of other actors will be unsettling for the international system.

Defensive Cooperation Versus Defensive Positionality

Grieco (1990) argues that the possibility of some states’ seeking relative gains leads all states to forgo cooperative opportunities out of fear that others will take advantage of them. He labels this defensive positionality. But relative gains need not have this effect and instead can lead states to defensive cooperation. As we have seen, concern for relative gains in respect to some states is consistent with cooperation with other states. More surprisingly, cooperation with relative gains adversaries can be the best choice in a multilateral world, especially as the number of states increases. States that do not cooperate fall behind other relative gains maximizers that cooperate among themselves. This makes cooperation the best defense (as well as the best offense) when your rivals are cooperating in a multilateral relative gains world (Snidal 1991).

Conclusion

The realist argument that relative gains seeking greatly diminishes possibilities for international cooperation is not generalizable. It applies in the special case of tight bipolarity between states that care only about relative gains. Its truth diminishes rapidly if concerns for relative gains are less than total, or if the initial absolute gains game between states is not PD, or (especially) if the number of states increases to three or more. Since one or more of these conditions characterizes most international political phenomena, relative gains do not limit international cooperation in general.

Yet relative gains hold other interesting implications for international politics. I have not addressed the veracity of the assumption that states aspire to relative gains, only examined its consequences. The resulting conclusions connect relative gains to prevailing hypotheses about international relations theory and are plausible in light of postwar experience. Many of these implications should be unsurprising to both institutionalists and realists, since they correspond to prevailing academic folk wisdom. Others do not fit well with realist beliefs—for example, the claim that relative gains seeking makes multipolarity preferable. All of them are fairly casual and require tighter analytical specification and closer empirical analysis. But they point toward the sorts of testable implications that will ultimately be the proof or disproof of the relative gains hypothesis.

Finally, the analysis suggests a moral for international relations theorizing more generally. The realist argument is guided by an intuition that relative gains transform issues into highly conflictual—even zero-sum—situations where cooperation is not viable. The intuition is correct when there are just two states. The error lies in uncritically mistaking conclusions from a two-actor model for general claims about international politics with any number of actors. One thing we increasingly know about theoretical claims is that they are sensitive to particular changes and contexts. Only a more-careful working-through of the analytical argument will enable us to understand their consequences.
International Cooperation

Notes

I thank Christopher Achen, Robert Chirinko, Derek Eaton, Joanne Gowa, Mark Hansen, Robert Keohane, Charles Lipson, Andrew Moravcsik, James Nolt, Derek Scissors, Stuart Romm, Daniel Verdier, and the participants of the Program for International Politics, Economics, and Security (Pipes) at the University of Chicago for comments. Andrew Kydd provided wise advice and invaluable research assistance. The Pew Charitable Trusts provided generous support through their Program on Economics and National Security.

1. Grieco (1990) stresses this as a distinctive aspect of relative gains. As I point out, distributional concerns neither differentiate realism from liberal institutionalism as markedly as he would wish nor place the relative gains argument on its strongest footing. Much of Grieco's empirical evidence for relative gains is contestable because he cannot distinguish it from absolute gains bargaining over the distribution of cooperative benefits. Finally, his differentiation of the two models is biased, since his relative gains model includes absolute gains considerations but not the other way around. For a further discussion of these issues, see Snidal 1991.

2. I develop a simple model based on constant returns to scale where gains from cooperation are equal even among different-sized states. The point is that even if this were not the "natural" result, it could be achieved by renegotiating the terms of cooperation.

3. Misperception or uncertainty among risk-averse actors could still explain the failure of such deals. Although references to uncertainty are common in the relative gains literature (e.g., see the implicit reference to the quotation from Waltz in the text), it is not systematically developed as part of the relative gains argument. Moreover, uncertainty and risk aversity play a similar role under absolute gains. Much of Grieco's empirical evidence for relative gains is contestable because he cannot distinguish it from absolute gains bargaining over the distribution of cooperative benefits. Finally, his differentiation of the two models is biased, since his relative gains model includes absolute gains considerations but not the other way around. For a further discussion of these issues, see Snidal 1991.

4. This second aspect of relative gains seeking effectively incorporates the first, since cooperative agreements are evaluated in terms of relative payoffs. Now, however, the relative gains problem cannot be resolved by changing the terms of the agreement, since relative gains are fundamental to states and not a property of particular cooperative agreements.

5. Joanne Gowa (personal communication 26 September 1989) states this case succinctly: "Security gains, whenever they enter utility functions, are always relative." Rather than argue the point, I investigate its implications.

6. Elsewhere, I argue that there is no reason to presume that all international issues are adequately represented by PD or any other single strategic structure (Snidal 1985a). But that argument assumes states care about absolute gains, whereas the present one demonstrates how relative gains provide a basis for arguing that PD is a sufficient description for international issues.

7. Labeling particular behaviors as cooperation or defection independent of their consequences runs the danger of persuasive definition. This is exemplified by the peculiar definition of mutual cooperation in the deadlock game as an outcome where both sides are worse off than they would have been through mutual defection (Downs and Rocke 1990; Oye 1985). Such problems are avoided here by the stipulation that M > 0. Note, however, that in the two-actor situation gains from cooperation diminish to zero as relative gains concerns increase to unity.

8. Here we are interested primarily in the ordinal symmetry (i.e., same order of payoffs) necessary to define a two-by-two game; subsequently, the symmetry condition will be extended to entail interval-level symmetry with the algebraic comparisons of payoffs inherent to relative gains. This evaluation of relative gains requires that states compare gains but does not require interstate comparisons of utility. Thus, payoffs could be "objective" factors such as gains from trade or increases in military strength. Grieco argues against symmetry as an assumption because it entails equal payoffs from mutual cooperation (1990, 42). I have argued that this can be readily achieved by adjusting the terms of cooperation and is not central to the relative gains argument. Concerns for relative gains do help determine the mutually acceptable cooperative agreements—although that role is indistinguishable from bargaining over the distribution of absolute gains.

9. Four of the six games excluded by the F > U restriction are strictly harmonious in that each side has a dominant strategy to cooperate. The remaining two games are variants of the included assurance and coordination games. In addition, in all six of these games where U > F, relative gains reinforce absolute incentives to cooperate. Note 17 expands on this point. Finally, an alternate third assumption to restrict the number of games is that free-riding is preferred to mutual cooperation, F > M. This produces four two-by-two games. Three of these (F > U > M > 0, F > M > U > 0, and F > M > 0 > U) have F > U and so are included here. The fourth, U > F > M > 0, offers a minor variation on the included coordination game with F > U > M > 0, where relative gains facilitate cooperation.

10. Defining cooperative behavior in this game is...
difficult. One state cooperates by acceding to the other state’s preferred equilibrium outcome. The other state sacrifices nothing. Cooperation is therefore not well defined at the individual level but is defined at the collective level in terms of avoiding noncoordinated outcomes. When relative gains matter, cooperation is effectively redefined as choosing the mutually preferred noncoordination point. For this reason, this game fits awkwardly at several stages in the analysis. I give more detailed discussion of the contrast between PD and coordination elsewhere (Snidal 1985a).

11. Treating relative gains as differences in absolute gains is standard in the formal literature. Verbal discussions are often ambiguous, sometimes also referring to relative gains in terms of ratios or proportions. (See the Waltz quotation above.) The alternative formulation is easily handled here by treating absolute payoffs as the impact of cooperation on growth rates of payoffs and relative gains as differential growth rates.

12. This formulation is equivalent to Grieco’s (1990), where \( r = k/(1 + k) \) and \( k \) is his weighting parameter.

13. In the intervening case where \( U = M - F \), there is no transition zone between harmony and the PD. Finally, games that are symmetric in ordinal but not interval terms undergo a similar transition except that the two ordinal payoff structures are transformed at different rates. This leads to some additional and nonsymmetric intermediate games during the transition.

14. See Taylor 1987. The transformation of chicken reminds us of the peculiar consequences of relative gains: once \( r > U/F \), players in chicken prefer mutual noncooperation (or “disaster”) to unilateral cooperation.

15. Grieco incorrectly reports that increasing relative gains concerns can transform PD into deadlock (1990, 43). Examination of Grieco’s equation 4 shows that both sides cannot simultaneously have deadlock preferences.

16. Taylor (1987) develops this result. With two minor exceptions, the PDs that emerge in other games also become progressively more intense with the increasing importance of relative gains. The temptation to defect from mutual cooperation increases with \( r \), provided \( M > U \), which is true for all games considered here except coordination. The sucker cost of unilateral cooperation similarly increases with \( r \), provided \( F > 0 \), which is true for all the games here except assurance. The advantages of mutual cooperation over mutual defection always decrease with increasing \( r \).

17. This logic confirms that the assumption \( F > U \) is appropriate for examining how relative gains affect cooperation. When \( U > F \), the preference ordering under relative gains ultimately becomes \( U^* > M^* > 0 > F^* \). This harmonious deadlock game offers each side a dominant strategy leading to a Pareto-efficient equilibrium. Now, relative gains incentives reinforce cooperative incentives in the initial absolute gains game. Thus, to study how relative gains impede cooperation, it is reasonable to restrict analysis to cases where \( F > U \). This means, moreover, that the present analysis is constructed to be favorable to the relative gains case.

18. Formally, this measure is \( (\phi - \phi_d)/\phi - \phi_w) \), where \( \phi_w \) and \( \phi_d \) are the minimum discount rates required to support cooperation under pure absolute and pure relative gains, respectively.

19. These values are used in Figure 5 to locate the transition points between games. They are not used in Figure 4 because, with \( U = M - F \), these two scenarios collapse into one, with no transition zone between harmony and PD.

20. This is the case for other games, except chicken, at their point of transformation to PD. Chicken poses its own cooperation problem that can sometimes be resolved if states’ concern for future benefits is sufficiently high. Coordination and harmony (when \( U > M - F \)) pass through an intermediate chicken phase, where the discount factor matters even before PD is reached at higher \( r \).

21. The discussion in this paragraph is based on a “vertical” reading of Figure 7 to see the value of \( \phi \) indicated by a given level of \( r \). An alternative “horizontal” reading shows the level of \( r \) necessary to make a given \( \phi \) the lowest discount factor amenable to cooperation. This allows a comparison of the different levels of relative gains necessary to create a PD as intense as the standard PD when \( r = 0 \) and \( \phi = .5 \). Chicken requires \( r = .33 \); assurance I requires \( r = .5 \); assurance II requires \( r = .75 \); and harmony requires \( r = .8 \). Coordination always requires a higher \( \phi \), regardless of \( r \), reflecting the peculiarities it raises for the concept of cooperation as discussed above. These results strongly confirm the limited impact of relative gains in creating intense PDs from other absolute gains situations.

22. A variety of returns-to-scale assumptions appear in the literature. In economics, the standard trade model assumes constant returns, whereas analyses of the international division of labor and the “new” theory of international trade consider increasing returns to scale. On the security side, returns will be increasing with respect to alliance membership for public goods aspects of security provision (Olson and Zeckhauser 1966). Friedman (1977) explains the size and shape of nations by increasing returns to tax collection on trade and labor with constant returns to taxation on expanding territory.

23. The restriction \( s_i \geq 2 \) reflects the assumption that at least two units are required for cooperation as defined here. If \( s_i = 1 \), there is no domestic cooperation as measured in terms of these units. The measure of domestic cooperative benefits depends
on the definition of units because some cooperative activity that occurs within larger units is external to (i.e., occurs between) the smaller units. The measure of international cooperation is not affected by changes in units.

24. The situation is different if we consider gains from purely domestic cooperation. Under constant returns and autarky, larger states grow by absolutely larger amounts and therefore achieve relative gains. The situation is also different if we define relative gains in terms of the ratio of sizes. With constant returns and full global cooperation—that is, all domestic and international cooperative interactions occur—all states grow at the same rate and there are no relative gains. Because small states depend on international cooperation for a larger portion of their growth, large states could achieve relative gains by breaking off international cooperation. This ratio measure of relative position is not used here; but it is straightforward to see that increasing numbers of states decrease these incentives for noncooperative behavior for similar reasons as when states care about relative gains defined as differences.

25. Because we assume a PD situation, note that \("^r\)" is overstated if the absolute gains is not PD. Assurance I, for example, only becomes PD when \(r > .5\) and the impact of relative gains on it is less than for PD until \(r = 1\). Thus, the results are biased toward the relative gains hypothesis for the other five absolute gains games.

26. The key part of the restriction is \(\sum w_i \leq 1\), since higher sums favor the relative gains position. This follows directly from the balancing intuition for the symmetric case. If a state suffers an absolute gains loss of \(r\) in a world with \(n\) other states, each weighted \(w_i\), its relative gains payoff decreases by \((1 - r)w_i + r\sum w_{-i}\), as will be seen in equation 1. Since this is preferable to suffering the same absolute loss in a world of \(n - 1\) other states, each weighted \(w_{n-1}\), it is straightforward to show \(w_i \leq \frac{(n - 1)}{n}w_{n-1}\). Since it is preferable to suffer the same absolute loss in a world of \(n - 1\) other states, each weighted \(w_{n-1}\), it is straightforward to show \(w_i \leq \frac{(n - 1)}{n}w_{n-1}\). Because \(w_i = r \leq 1\), \(w_{n-1} \leq 1/2\). It follows by forward induction that \(w_i \leq 1/3\) and, in general, that \(w_i \leq 1/n\). Therefore, it must be that \(\sum w_i \leq 1\).

A parallel proof leads to the same conclusion regarding the sum of weightings when gains in relative power are more valuable in a world with fewer states.

27. We ignore payoffs from domestic cooperation, since these are not affected by international cooperation under constant returns. Note that if \(r = 1\) and all states weight all other states equally in relative gains (i.e., \(w_j = w_M\) for all \(i, j, k, l\)) then \(\sum w_i r = 0\) (Snidal 1991). Unequal \(w_s\)'s allow the sum of relative gains in the system to be positive or negative.

28. This comparison establishes the necessary conditions for a stable cooperative equilibrium. If joint tit-for-tat strategies are stable, there will be a multitude of other cooperative equilibria. Showing the minimum requirements for the existence of one such equilibrium is sufficient for present purposes of investigating how much more difficult cooperation is under relative gains. For a more detailed exposition, see Snidal 1991.

29. Unequal gains diminish the incentives of one side to cooperate (and increase the incentives of the other side) for both absolute and relative gains reasons. I have discussed how this aspect of relative gains can be handled by changing the terms of bilateral cooperation—notwithstanding the more important point that the two states still evaluate outcomes in terms of relative gains. Later I shall discuss circumstances under which an asymmetric distribution of benefits actually improves prospects for cooperation.

30. This parallels the finding cited above that relative gains have no impact in symmetric large-

31. This assumes that other states are weighted equally in terms of relative gains (i.e., \(w_{ik} = w_M\) for all \(j, k\)) so \(w_{ij} = 1/(n - 1)\). That is unproblematic for bipolarity, where there is only one other state, and for balance of power defined as a rough equality of the great powers. A perfect tripolar system would also have this property, although it is easy to imagine one state placing different weights on the other two major powers. Such a "two-and-a-half-power" system would fall between tripolarity and bipolarity as depicted here.

32. The maximum impact of \(r\) in percentage terms occurs when \(\phi_k\) approaches unity and equals \(2rw_r/rw + 1\) (100%). An example of the continuing drop-off of relative gains effects is the five-actor balance-of-power system (\(w = .25\)) with \(r = .25\) where the impact of relative gains must be less than 12%. The increase in \(n\) is defined in terms of significant actors, as I have discussed. A tripolar system, for example, has three significant actors regardless of the number of minor actors. These pure cases never exist but provide appropriate benchmarks for my arguments.

33. The relation between size and relative gains weights may be more complicated than the monotonic relation used here. A plausible curvilinear specification is that relative gains concerns peak when states are roughly equal and drop off when one state is either far behind, or far ahead of, the other. This would seem particularly appropriate for analyses of interactions between a rising challenger and a declining hegemon. It would alter the explanation for the posthegemonic breakdown of cooperation from that in the text to emphasize rising tensions between these two central actors. Finally, relative gains concerns may vary across issue dimensions. It makes little sense for small states such as Canada and Finland to worry about relative gains in security against their militarily formidable neigh-

725
bors. But they may worry about other dimensions such as economic relations where they are better able to counteract relative gains.

34. This supports Kaplan's view of multipolarity as fostering a complementarity between states (1957, 23). (Kaplan assumes that states measure relative gains against the system, not against each other.) Grieco argues that under relative gains, cooperative deals are easier when they involve larger numbers of states (1988a, 506). I show that what is important is the number of states that affect relative gains calculations, not how many participate in any particular cooperative deal.

References


Duncan Snidal is Associate Professor of Political Science and Public Policy, University of Chicago, Chicago, IL 60637.