Three Approaches to the Measurement of Power in International Relations

Jeffrey Hart

International Organization, Vol. 30, No. 2 (Spring, 1976), 289-305.

Three approaches to the measurement of power in international relations

Jeffrey Hart

There are three main approaches to the observation and measurement of power: 1) control over resources, 2) control over actors, and 3) control over events and outcomes. The control over events and outcomes approach emerges as the best approach to the measurement of power in contemporary international politics because: 1) it is the only approach which takes into account the possibility of interdependence and collective action, 2) it is more general than the other two approaches, and 3) it produces a type of analysis which has both descriptive and normative advantages. I will discuss each of these approaches at length and criticize them. I will argue that the third approach is superior to the other two for the measurement of power in contemporary international politics because it is better suited to situations in which interdependence and collective action can be derived from the third.

Power as control over resources

The control over resources approach is the most widely used and accepted approach to the study of national power.[1] Military expenditures, the size of armed forces, gross national product, and population are frequently used as indicators of national power in empirical studies. Rummel and others have shown that, across the

  [1] See, for example, J. David Singer and Melvin Small, "The Composition and Status Ordering of the International System: 1815–1940," *World Politics* 18 (January 1966): 236–82; and George Modelski, *World Power Concentrations: Typology, Data, Explanatory Framework* (Morristown, N.J.: General Learning Press, 1974).

set of all nations, these indicators tend to rank states in a consistent manner.[2] Even though there is a tendency toward consistency, some scholars have suggested that the presence or absence of *inconsistency* can be used to explain the behavior of nations. For example, Galtung and Rummel predict that nations which score high on some indicators but low on others will tend to behave in a hostile manner toward other nations.[3] In any case, the control over resources approach rests on assumptions about how control over resources can be converted into control over actors or events.

For example, some scholars suggest that if one takes into account intangible resources such as the structure of military forces, leadership skill, and the will to use force when necessary, then one can explain or predict, with a reasonable degree of success, the outcome of conflicts between nations. That is, there is a *conversion process* through which control over resources is translated into control over actors or events.[4] It is assumed that a set of resources, both tangible and intangible, can be found such that a general measure of national power, which is a function of the nation's control over different types of resources, will successfully predict the ability of the nation to get its way, despite opposition from others.

The main difficulties with this approach are: 1) it is not always certain that actors will be able to use resources which are nominally under their control; 2) it is not always clear what types of resources should be included in a general measure of power, and one suspects that for different types of conflicts different combinations of resources will be needed to explain the outcomes of conflicts; 3) some types of resources, such as the will to use force, are extremely difficult to measure; 4) the focus on national power precludes the consideration of the role of non-state actors in determining the outcome of conflicts; and 5) it is not clear how one is to deal with interdependence, coalitions, and collective action. To amplify this last point, suppose that one wishes to assess the power of a bloc or alliance of nations. Is the power of the bloc or alliance equal to the sum of the national power scores of its members? Some theorists suggest that this is so, but others assert that nations, by joining alliances, lose their flexibility in dealing with others and thereby lose control. Thus, they argue that the power of an alliance is less than the sum of its members' power.[5] Nevertheless, despite these objections, the control over resources

[2] Rudolph J. Rummel, *The Dimensions of Nations* (Beverly Hills: Sage, 1972).
[3] Johan Galtung, "East-West Interaction Patterns," *Journal of Peace Research*, No. 2 (1966): 146–77; Rudolph J. Rummel, "A Status-Field Theory of International Relations," Research Report No. 50, Dimensionality of Nations Project, University of Hawaii, August, 1971.
[4] Klaus Knorr, *The Power of Nations: The Political Economy of International Relations* (New York: Basic Books, 1975), pp. 9–10. See also Hayward Alker, Jr., "On Political Capabilities in a Schedule Sense: Measuring Power, Integration and Development," in Hayward Alker, Karl Deutsch and Antoine Stoetzel (eds.), *Mathematical Approaches to Politics* (San Francisco: Jossey-Bass, 1973), p. 325.
[5] For the argument that nations lose flexibility when they join alliances see J. David Singer and Melvin Small, "Alliance Aggregation and the Onset of War," in J. David Singer (ed.), *Quantitative International Politics* (New York: Free Press, 1968), p. 249. For the argument that

approach is needed for a number of theoretical purposes, some of which will be mentioned in the concluding section of this article.

Power as control over actors

The control over actors approach is perhaps the most familiar one to political scientists in general, if not to students of international politics. Robert Dahl's definition of power as the ability of A to get B to do something which he would otherwise not do[6] is a control over actors definition, and has not been greatly improved upon since its appearance in 1957.

One possible objection to Dahl's definition is that if A does not want B to do that "something," then his ability to get B to do it is not terribly useful, except insofar as the nonexercise of this power produces the desired results. Some people distinguish positive from negative power, where negative power is the ability to get someone to do the opposite of what you want. But I prefer to deal only with positive power, since the nonexercise of negative power can be interpreted as a form of positive power.

Another possible objection is that A may be able to get B to do a certain thing but not others. But in his original formulation, Dahl noted that power may be more or less limited in "scope." That is, power may be limited to a specific type of activity or domain of action. It is possible, therefore, for A to have power over B in one domain but not in another.

It also may be somewhat misleading to define power in a way which suggests a deterministic relationship between A's acts and B's behavior. A's acts may merely limit the range of alternative actions for B.[7] The compromise position between these two extremes, the one chosen by Dahl in his original article, is that A's action affects the probability of B's action. This probability may be interpreted as the effect of A's actions on B's over a series of attempts to exercise power or as the effect of A's action on B's "mixed strategy" on one particular attempt which is not repeated. In either case, the probabilistic approach is compatible with the idea of limiting alternatives.

Power can be coercive or noncoercive. A can get B to do something which he would not have done by using threat or persuasion. The persuasive type of power is sometimes called "influence," to distinguish it from coercive power. Klaus Knorr calls noncoercive power "nonpower influence" to distinguish it from both power, which in his formulation must be based on coercion, *and* influence, which can be used to refer to either coercion or persuasion. He also argues, quite convincingly,

the power of an alliance equals the sum of the power of its members see Dina Zinnes, "An Analytical Study of the Balance of Power Theories," *Journal of Peace Research,* No. 3 (1967): 270–88.

[6] Robert Dahl, "The Concept of Power," *Behavioral Science,* 2 (July 1957): 202.

[7] R. J. Mokken and F. N. Stokman, "Power and Influence as Political Phenomena," unpublished Research Paper, University of Amsterdam, 1974.

that "nonpower influence" has been a neglected concept in the study of international politics.[8] There is, of course, no consensus on the use of these terms. Therefore, I will assume that noncoercive power is a form of power since noncoercive power is consistent with Dahl's original definition.

There are clear and important examples of noncoercive power in international politics. Most of the power exercised in the recent conferences on population, food, and the law of the sea was noncoercive. Noncoercive power is exercised when for example, A supplies new information to B or A persuades B that their interests and goals are compatible. In this case, it may be questioned whether we can consider the change in B's behavior to be evidence of a power relationship. Bachrach and Baratz argue that there must be a conflict of interests in a power relationship.[9] But a more satisfactory precondition, in my opinion, is that there be a perceived conflict of interests *prior to,* but not necessarily after, the exercise of power.

Finally, one may want to distinguish between intentional and unintentional power. That is, a change in B's behavior may result from his *anticipation* of a change in A's behavior, despite the fact that A had no intention of changing his behavior or producing the change in B's behavior. A may be pleased or displeased about the change, but it is clear that he did not intend to produce the change. This is a phenomenon which Knorr calls "silent power."[10] An example of silent power in international politics is the eagerness of Burma to avoid any act which might seem offensive to the People's Republic of China. If there is a great deal of "silent power" in a particular relationship, it may be difficult to observe and measure power in general since silent power operates without any visible attempts to exercise power. Yet this is not the only disadvantage of the control over actors' approach.

It is possible for the weaker actor, even in a highly asymmetrical power relationship, to exploit its weakness to gain power over the stronger actor. For example, the South Vietnamese regime could affect the bargaining position of the United States during the Indochina war by putting itself in danger. Similar techniques were used by the Nationalist Chinese in the battle over Quemoy and Matsu.[11] The reason for the mutuality of power, even in asymmetric relationships, is that power is defined in terms of desired outcomes *for the more powerful actor.* If A has more power over B than vice versa, then B can still threaten noncompliance (at high cost, perhaps) in order to change A's behavior. B will succeed to the extent that the threat of noncompliance is credible and the compliance outcome is important to A.

This leads, as Harsanyi first demonstrated, to the game theoretic notion of power as a function of the outcome of bargaining between two actors. The

[8] Knorr, Chapter 10.
[9] Peter Bachrach and Morton Baratz, "Decisions and Non-decisions: An Analytical Framework," *American Political Science Review,* 57 (September 1963): 633.
[10] Knorr, pp. 9–10 and personal communication.
[11] Robert O. Keohane, "The Big Influence of Small Allies," *Foreign Policy,* No. 1 (1971): 163–81.

outcome of bargaining, in turn, depends on the expected utilities which the two actors assign to compliance and noncompliance outcomes as well as their relative abilities to escalate threats or offer inducements.[12] If the actors are self-interested utility maximizers, and if both can escalate threats in a way which places the mutual noncompliance outcome on a line connecting the "no agreement" point with the Nash solution point (the point which maximizes the product of utilities) in utility space, then the result of bargaining will be the Nash solution.[13] Thus, deviations from the Nash point can be used to indicate the degree of asymmetry in threat or inducement capabilities. Unfortunately, this approach requires a priori information about utilities, information which is only rarely available.

What game theory tells us is that power, seen as control over actors, is a rather complicated matter, involving both objective and subjective factors. Given the highly psychological nature of power relationships, is it ever possible to use available information to measure power?

A crude, but nevertheless serviceable, method is to set aside negative, non-coercive, unintentional, and silent power and to observe systematically actual attempts to exercise power (i.e. positive, coercive, and intentional power) and the results of these attempts. Strangely enough, this sort of investigation has been extremely rare in the study of international politics. Perhaps the best explored territory is the use of economic sanctions to pursue political goals.

Before I review this research, I would like to show how the use of economic sanctions fits into the more general framework of power as control over actors. Suppose nations A and B are engaged in a variety of economic exchanges—e.g. trade, investment, and aid. The ability of A to get B to do something which B does not want to do, using these exchanges as the basis for threats and inducements, depends on a variety of factors: 1) the relative value of these activities for A and B, 2) the availability of other types of exchanges and other possible partners, and 3) the availability of domestic substitutes for the exchange.

Let us focus on trade for the moment. Suppose that A trades with a large number of nations but receives only a small proportion of its imports from (and sends only a small proportion of its exports to) any particular nation (including B) while B's trade is highly concentrated in a few trading partners (including A). Suppose also that A imports and exports a wide variety of commodities while B tends to import manufactured or technological goods while exporting a limited variety of goods, most of which are unprocessed. Finally, suppose that A's trade makes up only a small proportion of its national product while B's trade makes up a large proportion of its product. Then doesn't it seem likely that A can get its way with B if it chooses to threaten the disruption of trade?

---

[12] John Harsanyi, "The Measurement of Social Power, Opportunity Costs and the Theory of Two-Person Bargaining Games," *Behavioral Science*, 7 (January 1962): 67–75.

[13] Horace Brock, *Social Choice, Distributive Justice and the Theory of Games with Non-linearly Transferable Utility*, unpublished Ph.D. dissertation, Department of Politics, Princeton University, 1975.

This is the assumption made by a number of "dependency" theorists,[14] but there are several reasons why it might not be true: 1) B may have alternative trading partners which can absorb a high proportion of its exports and which can supply goods normally imported from A; 2) B can find substitutes for the goods imported from A at reasonable prices; and 3) B may be willing to absorb the losses caused by the disruption of trade as the cost of avoiding compliance with A's demands.[15] Even when conditions are ideal for the exercise of economic power, therefore, the sanctioned nation may still refuse to comply with the demands of the sanctioners. Indeed, it may be considered more ignominious to bow to economic sanctions than to military force.[16] Also, it appears that the use of sanctions often fails to produce the desired results because the imposition of sanctions increases the domestic support of the sanctioned government. There is also the possibility that the ill effects of sanctions can be shifted onto some innocent or powerless sector of society. Thus, the unequal internal impact of sanctions, increased domestic support, and national pride can enhance the willingness of governments to absorb losses.

Studies of actual attempts to exercise economic power show, almost universally, that such attempts are rare historically and rarely succeed. For example, Klaus Knorr concluded his study of the question by noting that:

> Coercively wielding economic power by means of trade reprisals or special trade advantages is rarely successful, because even states of great economic strength do not command a compelling degree of monopolist or monopsonist control in their foreign trade, and because the punishment that can be imposed by these means does not inflict enough pain, on the one hand, and tends to arouse the will to resist, on the other.[17]

There are other methods of exercising economic power: e.g., 1) the raising of prices; 2) the use of import or export restrictions; 3) the curtailing of credit and/or the freezing of assets; 4) the dumping of currencies; 5) the reduction of foreign aid

---

[14] See, for example, Johan Galtung, "A Structural Theory of Imperialism," *Journal of Peace Research,* No. 2 (1971): 81–117; Robert LeRoy West, "Economic Dependence and Policy in Developing Countries," in C. Fred Bergsten and William G. Tyler (eds.), *Leading Issues in International Economic Policy* (Lexington, Mass.: Lexington Books, 1973); and Robert R. Kaufman, Daniel S. Geller and Harry I. Chernotsky, "A Preliminary Test of the Theory of Dependency," *Comparative Politics,* 7 (April 1975): 303–30. Not all dependency theorists, and especially not Latin American dependency theorists, make this assumption.

[15] Examples of the substitution of new trading partners for old ones as a result of an attempt to apply economic sanctions are: 1) the diversion of trade from Britain to the Soviet Union by Iceland in 1953; 2) the diversion of trade from the United States to the Soviet Union by Cuba in 1959–60; and 3) the diversion of trade from the Soviet Union to China by Albania in 1961. An example of the absorption of a loss caused by sanctions is that of Rhodesia from 1966 to 1968. Despite a rapid decline in trade, Rhodesia resisted pressures to change its constitution to provide for equal treatment of blacks. See Knorr, Chapter 6, and Peter Wallensteen, "Characteristics of Economic Sanctions," *Journal of Peace Research,* No. 3 (1968): 248–67.

[16] Klaus Knorr, personal communication.

[17] Knorr, p. 165.

or investment; and 6) nationalization of foreign enterprises.[18] Each of these methods has different effects on the nations involved, and the effects are not always anticipated. But the fact that they are used means that it is possible to observe attempts to exercise economic power. Whether attempts are successful depends on the initial goals of the actors and the outcomes. The direct observation of these phenomena should be an improvement over the use of measures of potential bilateral power (sometimes called "dependency") such as the ratio of bilateral trade to GNP, the ratio of bilateral trade to total trade, or measures of the commodity composition of trade.[19] These indicators of "dependency" may be useful in defining the constraints to economic power and may help to explain variation in other variables, but they are no substitute for more direct measures of power.

I conclude, therefore, that it is possible to observe attempts to exercise economic power and to assess the success of these attempts if the initial goals of the actors can be discovered, and if negative, noncoercive, unintentional, and silent power are assumed to be relatively unimportant. A similar argument could be made for the exercise of noneconomic power. It may be feasible, then, to test the "conversion" theories advanced by those who favor the control over resources approach. That is, it may then be possible to test the hypothesis that nations with greater control over resources are able to exercise control over other actors more successfully than actors with less control over resources. If noneconomic power is like economic power, the hypothesis will be disconfirmed.

Besides the measurement problems discussed above, there are a number of other possible disadvantages to using the control over actors approach. Although it may be possible to include non-state actors in observations of attempts to exercise power, it is not a simple matter to determine the degree to which subnational, transnational, or supranational actors are independent of the national governments with which they are associated. When the European Community acts on an issue of interest to only one of its members is it acting as an independent agent or as an agent of the government in question? When a multinational corporation acts in cooperation with one government against another, does it act as a free agent or as the agent of the cooperating government? Also, it is not clear how one is to deal with collective action and coalitions, in general. The emphasis on bilateral power in the control over actors approach means that one must either disaggregate collective action into its bilateral components, or else treat coalitions (sets of actors) as if they were more or less the same as governmental actors. Disaggregation is difficult in situations in which collective action is possible but bilateral action is not.[20] This

[18] Ibid., p. 83. See also Klaus Knorr, *Power and Wealth* (New York: Basic Books, 1973), pp. 80–1.

[19] For the most sophisticated example of this sort of research, see Norman Schofield and James Alt, "On Clique Analysis of Trade Relations," paper presented at the Fourth Colloquium on Mathematical Sociology, Hemsedal, Norway, January 1974.

[20] For example, no single member of OPEC can afford to raise crude oil prices without the

seems particularly unfortunate since international politics may be increasingly oriented toward collective actions of this sort in the future. Finally, since control over other actors may be limited in scope to a particular activity, and since bilateral power in one domain may be quite different from that in another, it is not obvious how one is to reconcile these differences in an overall assessment of bilateral power. Whereas in the control over resources approach, there is a problem of aggregation across resources, here there is a problem of aggregation across types of activities. Nevertheless, there are a number of reasons why this approach should not be discarded altogether, some of which I will discuss after describing the third major approach to the measurement of power.

Power as control over events and outcomes

This approach was first developed by James S. Coleman and is best articulated in his book, *The Mathematics of Collective Action.* [21] It is based on a rational choice theory of power, in which the reasons for controlling resources or other actors arise out of the desire to achieve certain *outcomes.* Outcomes are social states which are the results of individual or collective action and which are mutually exclusive. Desired outcomes, or *goals,* can be defined as outcomes which produce a net increase in the actor's utility, where utility is simply a function of the actor's preferences over the set of outcomes.

Instead of making a direct connection between actions and outcomes, Coleman provides for intermediate links between actions and *events* and between events and outcomes. Each event is associated with at least one outcome for each actor, and each outcome is associated with a net impact on utility. Events associated with more than one outcome in a probabilitistic fashion will be associated with an *expected* utility, equal to the sum of expected net impacts on utility of each outcome. The focus on events, rather than outcomes, frees the analyst from having to identify all the possible, mutually exclusive outcomes of every action, and allows him to focus on events, of which there will be a smaller number and which may be associated with sets of outcomes which are not mutually exclusive. Also events will be more salient to the actors themselves than outcomes since people do not normally think about the consequences of their actions in terms of mutually exclusive social states.

---

collaboration of others. The cost of exerting bilateral power in that way is to lose a share of the world market as consumers shift to less expensive exporters. Similarly, permanent members of the Security Council can act on a unilateral or bilateral basis in intense conflicts, such as that in the Middle East, only at the expense of risking unilateral or bilateral intervention by another permanent member. Multilateral action, by reducing uncertainties connected with simultaneous unilateral or bilateral interventions in intense conflicts, is less "expensive" than bilateral action, even though the unilateral or bilateral option always exists.

[21] James C. Coleman, *The Mathematics of Collective Action* (Chicago: Aldine, 1973). See also Peter Abell (ed.), *Organizations as Bargaining Influence Systems* (New York: Halsted Press, 1975), for a slightly modified version of Coleman's theory.

Clearly, if one actor has total control over all events, then that actor has no need to control other actors. He can simply present them as a fait accompli. Similarly, although one expects to use resources to gain control over events, there is no a priori reason to believe that the degree of control over events is directly proportional to the degree of control over resources. Therefore, unless the actors regard control over other actors or resources as valuable in themselves, then the ability to control actors and resources will be considered secondary to the ability to control events.[22]

If an actor does not have total control over all events, but only those events which are *consequential* to him, i.e. which produce net gains or losses in utility, then that actor also has no need to control other actors. But normally actors have only partial control over events which are consequential to them. Also, some events are likely to be consequential for more than one actor. Therefore, in general, *actors tend to share control over events which are mutually consequential.* A few examples of this shared control in international politics may be useful here. The United States and the Soviet Union have, individually, only partial control over the likelihood of a nuclear exchange. There is no foreseeable way in which either can obtain total control over this event (despite elaborate attempts to develop first-strike capabilities on both sides). Yet a nuclear exchange would have drastic consequences for both nations. Similarly, the industrialized nations have only partial control over the recovery of the world economy in a global recession, yet such recessions are consequential for all.

It is possible for actors to have control over events which are consequential for others, but not for themselves. For example, the United States excluded Venezuela and Ecuador from the recent Trade Act because of their membership in OPEC. This would have excluded the two countries from the benefits of prefer-ential tariffs, while the consequences for the United States in terms of increased tariff revenues or future participation of the two countries in OPEC would not have been substantial. But this sort of situation may be rare, and it is interesting to note that the United States changed its policy after other Latin American governments came to the defense of Venezuela and Ecuador.

Thus, the most common form of control over events in contemporary international politics may be shared control over mutually consequential events—a condition which some scholars might call "interdependence."[23] Since neither the control over actors nor the control over resources approaches are capable of dealing with interdependence, it would be extremely useful to have an approach

---

[22] I think it is realistic to assume that actors will not value control over actors or resources independently of its usefulness in obtaining desired outcomes, because it is usually expensive to maintain this sort of purposeless control. Nevertheless, there may be some actors who hoard resources or collect dependencies for no apparent reason.

[23] There are a variety of nuances to the concept of "interdependence" which may not be consistent with the notion of shared control over mutually consequential events. On this question, see John Ruggie, "International Responses to Technology: Concepts and Trends," *International Organization*, 29 (Summer 1975): 562–4.

which is. This is one of the major advantages of the control over events and outcomes approach.

Coleman's theory suggests that one start by identifying a set of actors and a set of events. This step is very important because by identifying a finite set of actors and events, one is delimiting the boundaries of a "system" in which power can be exercised. The boundaries, to be realistic, should coincide with the boundaries which are perceived by the actors themselves. Then one estimates the entries of two matrices: 1) the *control matrix* (C) whose entries, c_{ki}, represent the degree of actor i's control over event k, and 2) the *interest matrix* (X) whose entries, x_{ik}, represent the proportion of the total interest of actor i in event k. From these one can derive a *bilateral power matrix* (Z), which represents patterns of bilateral dependency and interdependence among the actors. One can also, under certain conditions, derive a measure of the control over power resources that each actor has.

Given this brief summary of the theory, I would like to demonstrate how it works in greater detail by applying it to an example taken from contemporary international politics. Let us assume that there are four major actors in the international system: the United States and its allies, the Soviet bloc, the OPEC nations, and the Fourth World (all other developing and nonaligned nations). This is, of course, a gross simplification which I will use only for the purpose of illustration.[24] Consider the control of these actors over the following set of "events": 1) the prevention of major war, and specifically a nuclear exchange between superpowers; 2) a redistribution of world power and wealth in favor of the OPEC nations; 3) a redistribution of world power and wealth in favor of the Fourth World; 4) settlement of the Middle East conflict in which all parties recognize each other's right to exist; and 5) the establishment of an international ocean authority with the ability to conduct research, to license and tax private and public exploitation of ocean resources and to exploit resources itself, if necessary.

Let c_{ki} stand for the degree of control of actor i over event k. It will be assumed that the sum of all actors' control over a specific even k will be equal to one and each actor's control will vary between zero and one. I have estimated a control matrix for the actors and events listed above, which looks like this:

Control Matrix (C)	Actors			
	US	SU	OPEC	4th World
Controlled Events				
prevention of major war	.5	.5	0	0
redistribution to OPEC	.3	.1	.5	.1
redistribution to 4th World	.6	.2	.2	0
settlement of Arab-Israeli	.3	.3	.4	0
international ocean authority	.2	.2	0	.6

[24] It is, nevertheless, a simplification also used by C. Fred Bergsten in "The Response to the

Now we consider the effects which events have on the utility of the actors. Let y_{ik} be the relative gain or loss in actor i's utility if there is collective action on event k. This gain or loss is defined as follows:

$$y_{ik} = \frac{u_{ik_1} - u_{ik_2}}{\sum\limits_{k} |u_{ik_1} - u_{ik_2}|}$$

where u_{ik} = the utility of actor i of event k

k_1 = collective action on event k

k_2 = no collective action on event k

Thus, y_{ik} can vary between 1 and −1 and the sum of the absolute values of y_{ik} for a particular actor over all events equal 1. Let x_{ik} equal the absolute value of y_{ik} and s_{ik} equal the sign of y_{ik}. The x_{ik} will be called the *interest* of actor i in event k and s_{ik} will be called the *direction of interests*. The matrix formed by the x_{ik} values will be called the *interest matrix*. I have estimated the interest matrix for the events and actors in this particular example below.

Interest Matrix (X)

	Events				
	prevention of major war	redistribution to OPEC	redistribution to 4th World	settlement of Arab-Israeli	international ocean authority
Actors					
US	.4	.2	.1	.2	.1
SU	.4	.1	.1	.3	.1
OPEC	.1	.5	.1	.3	0
4th World	.1	.1	.5	0	.3

The two products of the control and interest matrices, CX and XC, can tell us about the ways in which events are linked to other events and actors are linked to other actors. The product $x_{ik}c_{ki}$ represents the fraction of actor i's total interests which are controlled through event k. The sum of this product over all events is the fraction of i's total interest controlled by i through all events. Let Z=XC. Then z_{ij} is the fraction of i's total interests controlled by actor j through all the events. Therefore the Z matrix represents the patterns of bilateral dependence and interdependency among the actors. The product $c_{ki}x_{ik}$ represents the fraction of actor i's interest in event k which can be controlled by him directly. The sum of this product over all actors in the fraction of control over event k which is held by all actors who are interested in k. I will call Z the *bilateral power matrix*. For the example given above it is as follows:

Bilateral power matrix (Z)

	Controlling actors			
	US	SU	OPEC	4th World
Controlled Actors				
US	.40	.32	.20	.08
SU	.40	.34	.19	.07
OPEC	.35	.21	.39	.05
4th World	.44	.22	.15	.19

The first two entries in the first row of the bilateral power matrix were computed in the following manner. The entry in the first column and first row, z_{11} , was obtained by multiplying the entries in the first row of the interest matrix times the corresponding entries in the first column of the control matrix and adding the products. That is, z_{11} = ((.4 × .5)+(.2 × .3)+(.1 × .6)+(.2 × .3)+ (.1 × .2)) = (.20 + .06 + .06 + .06 + .02) = .40. The entry in the second column and first row, z_{12} , was obtained by multiplying the entries in the first row of the interest matrix times the corresponding entries in the second column of the control matrix and adding the products. That is, z_{12} = ((.4 × .5)+ (.2 × .1) + (.1 × .2)+(.2 × .3)+(.1 × .2)) = (.20 + .02 + .02 + .06 + .02) = .32.

In the bilateral power matrix, the United States and its allies have more power over others than vice versa. The United States and its allies, the Soviet bloc and OPEC have much more control over their own preferred outcomes than the Fourth World. The United States has more bilateral power over other actors than OPEC, the Soviet bloc or the Fourth World. OPEC is the only actor which has more control over its own preferred outcomes than does the US.

Coleman also suggests that actors may be willing to trade control over some events in exchange for control over others. Their willingness to do so depends on the "value" or "price" which they attach to each event. If we let v_k equal the value of event k, and let the sum of all values equal 1, then equilibrium occurs when

$$v_k = \sum_i x_{ik} \sum_l v_l c_{li}.^{25}$$

It follows from this definition of equilibrium that if an actor has varying amounts of interest in different events, then his maximizing behavior will lead him to attempt to gain control of an event which is second most important when gaining control of the most important is too costly.[26]

I will not bother to compute the equilibrium values of the events in the example because I do not believe that all the actors in that system would attach the

[25] Coleman, p. 79.
[26] Ibid., p. 86.

same "values" to the events in question. That is, I do not think that there are likely to be exchanges of control or that the system is in equilibrium in Coleman's sense. Nevertheless, it is possible that the Fourth World nations might be willing to trade some of their control over the establishment of an ocean authority in exchange for more control over redistribution. Similarly, the United States might wish to relinquish some control over the prevention of major war in order to get a settlement of the Middle East. Either of these two exchanges would decrease the inequities in bilateral power.

There are other ways to affect the distribution of bilateral power in systems such as the one above. The set of events which make up the system is very important. By keeping the events separate, i.e., by foregoing opportunities to trade control, the actors can have the illusion if not the reality of greater control. By adding new, mutually consequential events over which they have control, but others do not, actors can increase their power over others. Another way to affect bilateral power is to influence other actors to change their goals and preferences. The developing nations can, for example, try to make redistribution a greater interest of the superpowers.

There is also the question of the *legitimacy* of bilateral power differentials. For example, in the case of the prevention of major war, it has traditionally been maintained that one of the responsibilities of major powers was to keep order in the international system:

> Historians acknowledge, and political scientists agree, that the world's major powers, commonly referred to as the Great Powers, have in the past frequently, and at times less than perfectly, assumed a widely recognized responsibility for safeguarding international peace and security.[27]

If this principle is widely accepted, there may be no way of decreasing bilateral power differentials between major and lesser powers as long as the set of actors remains restricted to nations or blocs of nations. Perhaps it is only with the addition of powerful non-state actors, such as global peacekeeping forces, that these sorts of power differentials can be overcome.

The *desirability* of decreasing power differentials clearly depends on one's assessment of the legitimacy of goals and preferences. If one does not accept the idea that the prevention of major war should be the primary goal of the nuclear superpowers, or if one holds that redistribution should be a prerequisite for peace, then the superior bilateral power of the superpowers in the example above will be unacceptable. Similarly, if one thinks that the goal of preventing a nuclear exchange must take precedence over all other collective goals, then the superior position of the superpowers may be acceptable.

[27] Modelski, p. 5.

Intense disputes, such as that in the Middle East, are important because actors may be willing to exchange control over global goals and interests for control over regional interests. Regional interests tend to be much more politicized and actors are more likely to have opposite directions of interest. For example, the Soviet Union is often thought to be in favor of maintaining tensions in the Middle East so that it can exploit the need for armaments to secure spheres of influence. The United States, for domestic and international political reasons, would prefer a settlement. If the United States traded control over prevention of war for more control over a settlement, the result might be that the Soviets would use their relatively greater control over the prevention of war to counteract the United States' greater control over a settlement of the Arab-Israeli conflict. This sort of reduction of bilateral power differentials could be a mixed blessing.

How is Coleman's theory related to the power as control over resources approach? If it is possible to assume that a particular system is in equilibrium, as defined above, then one can use Coleman's definition of power resources of actor i as

$$r_i = \sum_k v_k c_{ki}.$$

This represents the fraction of the total value in the system over which actor i has control. Thus, both bilateral power and control over resources can be derived from the control over events and outcomes approach to power. But note that in the case of control over resources, it must be assumed that an exchange of control is possible and that this exchange tends to equilibrium.

Note also that the estimates of "bilateral power" which are obtained by multiplying the interest and control matrices do not take into account the possibility that actors may not accurately perceive the degree of control which they have over events or the interest which other actors have in those events. For example, actors may have greater bilateral power than they think because they underestimate the degree to which other actors are interested in events under their control or they underestimate the degree of control which they exercise over events consequential to others but not to themselves. Also, actors may not exercise this bilateral power consciously or intentionally. Thus, it will still be necessary to supplement estimates of bilateral power using the control over events and outcomes approach with estimates of bilateral power using the control over actors approach, whenever intentional power is the object of inquiry or when misperceptions of control and interest are likely.

In sum, the control over events and outcomes approach, as exemplified by Coleman's theory, is extremely useful for measuring power in the context of interdependence and collective action. It allows one to derive insights about bilateral power and control over resources from estimates of control over and interest in events. Although there will be measurement problems connected with

the application of this approach,[28] data requirements are not as great as they are for conventional control over actors approaches, and analysis is richer, both descriptively and normatively, than that which is possible with the control over resources approach. Finally, its theoretical base, power derived from control over events and outcomes, is more general than the other two approaches.

Conclusions

Three approaches to the observation and measurement of power have been described and compared here: 1) control over resources; 2) control over actors; and 3) control over events and outcomes. The control over events and outcomes approach emerges as the best approach for the measurement of power in contemporary international politics, because: 1) it is the only approach which takes into account the possibility of interdependence among actors and of collective action; 2) it is more general than the other approaches; and 3) it produces a type of analysis which has both descriptive and normative advantages over the types of analysis which are associated with the other approaches. To amplify this last point, I would like to discuss briefly how estimates of control over resources and actors are used in theories of polarity and polarization in international politics.

The *polarity* of an international system is the number of major actors, or relatively cohesive *groups* of actors, in that system. *Polarization* is the process by which actors come to form blocs or coalitions.[29] Clearly the nature and degree of polarization can have a great impact on the polarity of a system, and vice versa. For example, before the formation of a relatively cohesive cartel of oil exporters, no single exporter accounted for more than a third of total world exports and no single producer accounted for more than a fifth of world production. After OPEC became effective, more than half the world's production and more than three-quarters of the world's exports were concentrated in the hands of the cartel. Thus, polarity and polarization are interdependent.

The observation of polarity requires that one be able to assess the proportion of total power which is possessed by any given actor or group of actors. For example, two recently proposed measures of polarity require that one have estimates of the power of each actor, p_i, and then use either comparisons of these estimates with one another or with total power, $\sum_i p_i$, to get estimates of the

---

[28] See Norman C. Dalkey, (ed.), *Studies in the Quality of Life: Delphi and Decision Making* (Lexington, Mass.: Lexington Books, 1972), for a discussion of how the use of multiple coders and error-correcting feedback can improve the accuracy and validity of estimates of this sort. The optimal measurement strategy would be to ask each coder or judge to estimate the control and interest of each actor, *as perceived* by the actors themselves. The possible consequences of differing perceptions may then be analyzed by computing the bilateral power matrix for each actor, based on its perceptions.

[29] Modelski, p. 2.

polarity of the system.[30] It should be clear that this approach to the measurement of polarity rests on the notion of power as control over resources, rather than power as control over actors. As such, it shares the disadvantages of the control over resources approach: e.g., the emphasis on national actors and the difficulty of selecting a type of resource (or a set of types) which reflects the actual power of the actors.

The *main* disadvantage of this approach to polarity is that it takes no account of the impact of alliances or coalitions, through polarization, of the concentration of power in the system. One way to get around this problem is to supplement measures of polarity with assessments of the type and degree of polarization in the system. There are a variety of ways to do this, but one is to use information about bilateral power relationships. Let p_{ij} represent the degree of actual or potential power which actor i has over actor j. Then the matrix formed by these bilateral power scores represents all the bilateral relationships between pairs of actors. In such a matrix, polarization may be indicated by the tendency of clusters to emerge in which actors are more able to exercise power over actors within their cluster than they can over actors outside the cluster. These clusters may be centralized, with one actor controlling all the others in its cluster, or decentralized, with each actor having some control over all the others. Thus, one can use the control over actors approach to observe and measure polarization in international systems. Information about polarization can then be used to improve estimates of the polarity of the system.

Therefore, the control over resources and actors approaches can be very useful for answering certain theoretical questions such as the impact of polarity and polarization on the peacefulness of international systems. But in my opinion, international tensions of the future will be based more on the perceived legitimacy of the global order, which is a function of the nature in which control over consequential events is shared among the nations and people of the world, and not of the number of major actors or the nature and degree of polarization in the international system. Thus, the normative aspects of the control over events and outcomes approach are central to its utility for the analysis of contemporary international politics.

The question which is always raised by power-oriented theories of international politics is: what can our knowledge about power tell us about desirable future directions for international politics? Information about past or present configurations of power may not be a good guide for the future since the goals, techniques, and even the fundamental nature of international actors have changed in the recent past and will continue to change in the future. Nations, while still the

[30] Ibid., p. 2, and Joseph S. Nye, Jr., "Ocean Rule-Making from a World Perspective," in *Perspectives on Ocean Policy* (Washington, D. C.: United States Government Printing Office, 1975): p. 243f. For a general critique of this literature, see Joseph L. Nogee, "Polarity: An Ambiguous Concept," *Orbis* 18 (Winter 1975): 1193–1225. Nye and Modelski have answered Nogee's main criticism by attempting to set explicit criteria for measuring polarity.

primary actors in international politics, are getting stiff competition from sub-national, transnational, and supranational organizations. Actors are much more interested in economic goals than before, and have adopted a new range of techniques for pursuing those goals in the international system.

These arguments, in my opinion, support rather than undermine the necessity for power-oriented theories. The control over events and outcomes approach to power is capable of dealing with new types of actors and changing goals or techniques, as is the bilateral power approach. Non-national actors are important not because they are new, but because they may have become more powerful. The fact that it may be possible to talk about power, collective action, and interdependence in the same theoretical context should be seen as a plus for the control over events and outcomes approach.

Perhaps the most important argument in favor of power-oriented theories is that most, if not all, contemporary actors think about international politics in terms of power. Theories which do not reflect these concerns will be less useful, both descriptively and normatively, than those which do.