In Defense of Unrealistic Assumptions*

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I argue that a theory's assumptions always are and ought to be unrealistic. Further, we should attempt to make them more unrealistic in order to increase a theory's fruitfulness. Many sociologists believe that a theory's assumptions ought to be empirically realistic. I contend that this criticism probably stems from the confusion of a theory's assumptions with its scope conditions. While Friedman's (1953) similar prescription is associated with the instrumentalist philosophy of science, I maintain that it is also consistent with the realist view if "unrealistic" is taken to mean "incomplete" rather than "untrue." I discuss a recent theory of the value of children by Friedman, Hechter, and Kanazawa (1994) to point out how assumptions differ from scope conditions and how empirically plausible and realistic hypotheses can be logically deduced from highly unrealistic assumptions. I then discuss Kollock's (1993a, 1993b) revision of Axelrod's (1984) Cooperation Theory as an example of when assumptions need to be revised.

There is consensus among social scientists that a theory's assumptions ought to be empirically realistic. Because this is so, a potent criticism of a theory is to point out that its assumptions are unrealistic. This is the tack, among others, that critics often take to fault rational choice theory, for example. Thus Ritzer (1990:12) writes: "It seems to me unlikely that rational choice theory will attract as wide a number of adherents in sociology for many of the same reasons that it was rejected by the early theorists. Among other things, it ignores or downplays values and beliefs, has an unrealistic view of the actor, ignores the reality of the empirical world, and tends toward micro determinism." Similarly, Smelser (1992:388) notes: "The model of rational calculation is psychologically unrealistic."

Against James S. Coleman's *Foundations of Social Theory* (1990), various critics make the following charges:

> Every theory of society must make certain assumptions about action and order. From this perspective, Coleman's first problem is that he adopts a restrictive, unrealistically instrumental view of action. (Alexander 1992:206)

> Coleman's assumption that actors are rational, despite his strong defense, remains problematic. As has often been observed, such an assumption fails to provide a sufficiently complex accounting for human motives which stand behind actions. (Burk 1991:719)

> Here is an essential failing in Coleman's theory. A good deal of evidence suggests that humans have cognitive limitations, that they are not very good at calculating, and that they often fall back on heuristics (in another parlance, ethnomethods) to avoid having to engage in calculations. (Collins 1991:86)

Coleman's people live in a refreshingly benign world. Their social life includes no exploitation or coercion in the usual senses of these words, since his people take every action—including submission to slavery—voluntarily and to their own advantage. (Tilly 1991:1010)

In connection with Coleman's first theoretical principle of humans as purposive, rational actors, the inevitable question arises: What about the fact that individuals do not always act rationally? (Smelser 1990:780)

The assumptions on which Coleman builds his analysis of utility comparisons make very little sense, for the same reasons that economists' models so seldom correlate with typical human action—based, as they are, on ordinal comparisons of personal utility that make for neat models, yet meaningless descriptions of human life. (Sica 1992:252)

Critics make similar points with regard to Michael Hechter's *Principles of Group Solidarity* (1987): "The author's downplaying of society as a moral order and his conception of social actors as rational egoists will predictably invite criticism" (Stolzman 1989:246).

However, criticizing a general theoretical perspective for its unrealistic assumptions is not an exclusive domain of those who are skeptical of rational choice theory. In fact, rational choice theorists themselves often employ this strategy in their critique of other general theoretical perspectives. Thus, in his critique of game theory, Hechter writes:

The assumption of complete information mandates that the strategy options and payoffs of every player should be common knowledge among all players. . . . While uncertainty about the strategies available to other players is common, the notion that players have full information about each other's payoff functions is exceedingly restrictive. (1992:36)

The assumption of perfect information raises an issue that is far more straightforward. Were this assumption realistic, then real-world participants in collective action dilemmas would be able to infer both the strategies available to other players and other players' payoffs simply by knowing how they behaved in previous games. In other words, players are assumed to have zero monitoring costs. (1992:37)

Others who are generally sympathetic to rational choice theory also make the same criticism of game theory.

As important as this theoretical research [by Axelrod and other game theorists] has been, there are a number of assumptions in most of the work to date that seriously limit the generalizability of these conclusions. Perhaps the most important is that almost all previous work has assumed the existence of perfect information. In Axelrod's tournament, for example, actors could recognize each other without error, and perceived and remembered each other's actions with perfect accuracy. Yet in actual interaction there are many sources of uncertainty and distortion. (Kollock 1993b:4)

The first central objection to GT [game theory] is that it mostly assumes actors with strong egoistic motivations. . . . A second central objection to GT is that it relies on

an unrealistic image of hyperrational human beings. . . . Many of the assumptions made about the computational capabilities of human actors are unrealistic and just plain wrong. (Petersen 1994:498–99)

Thus the idea that a theory's assumptions ought to be realistic and accurately mirror the empirical world seems to be common among both the critics and advocates of rational choice theory; in fact, it is widely shared by most social scientists. In this article, I argue against this position. I first concur with Friedman (1953), Jasso (1988, 1989), Cohen (1989), and Stinchcombe (1991) that theories should not be judged by the properties of their assumptions, and thus tinkering with assumptions is not a productive exercise. I then extend their work and advance the argument that, to the extent that assumptions are tinkered with, we should make our theory's assumptions *more* unrealistic, rather than *less*. My contention is that, *ceteris paribus*,[1] the more unrealistic a theory's assumptions are, the more fruitful and parsimonious the theory. Unlike Friedman's (1953) earlier and highly influential article, which makes a similar point, my argument stems from a realist philosophy of science. I illustrate it with a recent theory of the value of children by Friedman, Hechter, and Kanazawa (1994), and then discuss why some assumptions nevertheless need to be revised, using Kollock's (1993a, 1994b) revision of Axelrod (1984) as an example.

Let me clearly state at the outset some significant limitations of my argument. There are two premises upon which its success hinges. First, the argument follows from a specific definition of "unrealistic": Assumptions are unrealistic to the extent that they are *incomplete* descriptions of the empirical reality.[2] Unrealistic assumptions leave out much of the complexity of the empirical world. While there are other, equally reasonable definitions of "unrealistic" (such as "untrue" or "abstract"; Nagel 1963:181–84), I define unrealistic as incomplete because that is how the critics of rational choice theory and game theory quoted above seem to use the word in their critiques. Unrealistic assumptions in my argument emphatically do *not* mean untrue assumptions.

Second, my argument presumes a particular conception of scientific theory. I define a theory to be a causal explanation of an empirical phenomenon (Hechter 1987:1n) or, more descriptively, "a set of assumptions or postulates with which one approaches some part of the empirical world, a set of concepts in terms of which this part of the world is described, and a set of propositions, emerging from the assumptions and relating the concepts, about the way this part of the world 'works' which are checked against observations of that world" (Stryker 1959:111). Although many sociologists implicitly adopt this conception of theory, it is most completely explicated and defended in Cohen (1989). There are undoubtedly other conceptions and other ways to construct and use theory, especially for engineering and applied purposes.[3] My argument here (that assumptions are and ought to be as unrealistic as possible) does *not* apply to such other conceptions and uses of theory.

[1]What is held constant in this context are internal logical consistency of the theory and empirical support for it. See note 6 below.

[2]This does *not* mean, however, that the purpose of a theory is to describe the empirical world; it is not. The purpose of a theory is to *explain* the empirical world (see the next paragraph). But, as I argue below, assumptions are only part of the theory and cannot by themselves provide causal explanations. All assumptions can do *by themselves* is to describe some limited part of the empirical world.

[3]One such applied use of theory is to ascertain which or what kind of initial conditions lead to socially desirable outcomes, such as optimal economic performance or democracy (Arrow and Hahn 1971). Another, more exploratory, purpose of theory is to make sense out of the world, by starting with a restrictive set of initial conditions and then gradually relaxing them to see how different outcomes obtain (Petersen 1992a; 1992b). For both of these purposes, descriptive richness or completeness of assumptions is often necessary.

WHY ASSUMPTIONS MUST BE UNREALISTIC

A scientific theory consists of two major parts: assumptions (or postulates) and hypotheses (or predictions) (Stryker 1959:111; Jasso 1988:3–5).[4] *Assumptions* are universal axiomatic statements about some part of the empirical world. They are not derivable from any other part of the theory. An assumption set is a set of all assumptions for a given theory. *Hypotheses* are deduced from assumptions through logic alone without any aid of empirical knowledge. The only requirement for an assumption set is internal logical consistency; assumptions of a given theory may not logically contradict each other (Jasso 1988:3). The assumption set is the logical starting point of a causal explanation in scientific theory and produces a set of empirically testable hypotheses. A theory is tested by subjecting its hypotheses, *not* its assumptions, to empirical evidence; assumptions of a theory are never tested or falsified (Jasso 1988, 1989; Cohen 1989; Stinchcombe 1991).

   Given that the empirical world is highly complex, with many variables operating, it follows that it takes a large set of statements to describe some part of the empirical world accurately.[5] The empirical complexity in its entirety is not reducible to a small set of descriptive statements. Let us say that it takes 1,000 separate statements to describe some part of the empirical world fully and accurately, in all of its complexity and with all of its variables. If this were the case, then if one uses only 100 statements to describe this part of the empirical world, one is ignoring 90% of its complexity. If one uses only 10 statements, then one is ignoring 99% of the complexity of this part of the empirical world. Not all statements need cover the identical range of empirical complexity, but there is a positive and monotonic relationship between the number of statements and the empirical complexity described; one cannot describe *more* of the empirical complexity with *fewer* statements. In general, therefore, the fewer the number of statements used to describe the empirical world, the more of its complexity is ignored, and the more incomplete and *unrealistic* the set of these statements becomes as descriptive statements.

   Consider the following two assumption sets about the values actors pursue in their choice behavior. In this example (and elsewhere in this article), the scope conditions are held constant; in other words, assume that the two theories, from which the following two assumption sets come, have identical scope.

Assumption set A.
   Assumption 1.
      Given a set of alternative choices (A, B, . . . , N), actors will choose the one that will maximize their *wealth* in their subjective expectations.
Assumption set B.
   Assumption 1.
      Given a set of alternative choices (A, B, . . . , N), actors will choose the one that will maximize their *wealth* in their subjective expectations.
   Assumption 2.
      Given a set of alternative choices (A, B, . . . , N), actors will choose the one that will maximize their *prestige* in their subjective expectations.

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[4]Other components of a theory include concepts (both primitive and defined terms) and scope conditions (Cohen 1989). Concepts are used to express both assumptions and hypotheses. My argument about the realism of assumptions operates *independently* of the scope of the theory. In other words, when I maintain that a theory with more unrealistic assumptions is better than one with more realistic ones, I assume that the two theories have identical scope conditions.

[5]This is true whether these statements are written in a natural language (such as English) or a formal language (such as mathematics or propositional logic) (Jasso 1988:6–9; Péli, Bruggeman, Masuch and Ó Nualláin 1994).

Assumption 3.

Given a set of alternative choices (A, B, . . . , N), actors will choose the one that will maximize their *power* in their subjective expectations.

Assumption 4.

Given a set of alternative choices (A, B, . . . , N), actors will choose the one that will maximize *social approval* by peers in their subjective expectations.

Assumption 5.

Given a set of alternative choices (A, B, . . . , N), actors will choose the one that will maximize their *sexual satisfaction* in their subjective expectations.

Assumption 6.

Given a set of alternative choices (A, B, . . . , N), actors will choose the one that will satisfy their *curiosity* most efficiently in their subjective expectations.

Assumption 7.

Given a set of alternative choices (A, B, . . . , N), actors will choose the one that will satisfy their *hunger* most efficiently in their subjective expectations.

Assumption 8.

Given a set of alternative choices (A, B, . . . , N), actors will choose the one that *they chose before*.

Assumption 9.

Given a set of alternative choices (A, B, . . . , N), actors will choose *randomly*.

Since actors pursue a variety of values such as wealth, prestige, power, social approval, sexual satisfaction, and satisfaction of curiosity and hunger, and since actors sometimes behave habitually or choose randomly (especially when there is no information available upon which to make rational calculations), there is no question that Assumption set B describes the state of the empirical world more accurately than Assumption set A. Further, since there are more than seven values that actors pursue, even the nine statements in Assumption set B are incomplete. Assumption set B will have to add more statements and incorporate more values (as well as choice strategies) in order to be more accurate empirically. The empirical accuracy or realism of an assumption set is thus an inverse function of its size.

One important criterion for assessing a scientific theory is its *fruitfulness* (Jasso 1988:3–5; Friedman 1953; Homans 1967:27; Merton 1967).[6] Theoretical fruitfulness is a ratio of the number and variety of hypotheses to the number of assumptions.[7] The larger in number and wider the empirical variety of the hypotheses, and/or the fewer in number the assumptions, the more fruitful the theory. A maximally fruitful theory should have as few assumptions as possible and as many hypotheses derived from these few assumptions as possible that make predictions about as wide a range of empirical phenomena as possible. As Friedman (1953:14) states: "A hypothesis is important if it 'explains' much by little, that is, if it

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[6]Theoretical fruitfulness or parsimony is only the third most important criterion for assessing theory. The most important is its *logical consistency*: If a theory lacks internal logical consistency, then nothing else matters and it should be rejected on that ground alone. The second most important criterion is *empirical support*. The less fruitful or parsimonious theory that has more empirical support is better than the more fruitful theory with less empirical support. If two theories are both internally logically consistent, and both are equally consistent with all available evidence, then the more fruitful and parsimonious of the two is the better theory. Lakatos's (1970:116) doctrine of sophisticated methodological falsificationism applies to all theories that have survived the first criterion of internal logical consistency.

[7]Jasso (1988:4) defines *quantitative* fruitfulness as the ratio of the number of hypotheses to the number of assumptions (Homans 1967:27) and *qualitative* fruitfulness as the capacity of an assumption set to generate hypotheses about phenomena not yet observed (Friedman 1953:7). Thus, holding quantitative fruitfulness (the numbers of assumptions and hypotheses) constant, a theory is qualitatively more fruitful if it can generate more nontrivial and nonobvious hypotheses.

abstracts the common and crucial elements from the mass of complex and detailed circumstances surrounding the phenomena to be explained and permits valid prediction on the basis of them alone." [8]

This is why assumptions of a theory must be unrealistic,[9] and further, the more unrealistic the assumption set the better, *ceteris paribus*. In an attempt to increase the fruitfulness of the theory, one must reduce the number of assumptions and, as a result, make the assumption set unrealistic and incomplete as a description of complex empirical reality.[10] One does not purport to make assumptions unrealistic for its own sake; it is just a necessary and unavoidable consequence of making the theory more fruitful.

From this perspective, it is important to recognize that *assumptions of a theory are not its scope conditions* (Cohen 1989:183–89; Markovsky 1994:16–20). *Scope conditions* are universal statements that define the class of circumstances to which a theory applies (Cohen 1989:83). Assumptions do not define the theory's empirical range of applicability; scope conditions do.[11] When certain empirical phenomena fall outside a theory's scope conditions, one cannot use the theory to explain them, and one cannot use them to confirm or refute the theory (Walker and Cohen 1985; Cohen 1989:82–84; Markovsky 1994:19–20). However, when a theory's assumptions are not realistic and accurate descriptions of a certain part of the empirical world, it does *not* mean that one cannot use the theory to explain phenomena in that part of the empirical world. For assumptions are *always* empirically inaccurate as descriptive statements because they are necessarily simplifications. Many of the criticisms of rational choice theory and game theory quoted above reflect this confusion of assumptions and scope conditions (see especially the quote from Kollock).[12] When theorists talk about "relaxing the assumptions" to make the theory more applicable, what they really mean is "relaxing (or broadening) the *scope conditions*." Assumptions have nothing to do with the theory's applicability.

RECONCILING FRIEDMAN'S ARGUMENT WITH THE REALIST VIEW OF SCIENCE

My argument that a theory's assumption set ought to be as unrealistic as possible closely resembles Milton Friedman's position in his 1953 classic article "The Methodology of Positive Economics." Friedman's view stems from an *instrumentalist* philosophy of science (Boland 1979).[13] Instrumentalists believe that theories are neither true nor false in any ontological sense. They aver instead that theories are useful computational devices that produce empirical predictions. If its predictions are supported by empirical data, the theory is a good instrument; if the predictions are empirically false, then the theory has no merit (Keat and Urry 1975:63–65; Boland 1979:210–11).

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[8]In his critique of rational choice theory, Smelser (1992:392–93) discusses Friedman's (1953) argument as a possible defense for its "unrealistic assumptions." It is instructive to note that Smelser fails to discount this argument by Friedman when he discounts all other possible defenses for rational choice theory.

[9]Another potential reason for descriptive incompleteness of a theory's assumptions is the theorist's cognitive limitations. As human beings, theorists have limited capacity to comprehend and describe the infinite complexity of the empirical world and must therefore limit themselves (and their theories) to a manageable range of the empirical complexity. I thank Trond Petersen for pointing out this possibility to me.

[10]"What Smelser means by realism [in his critique of rational choice theory] amounts to descriptive accuracy" (Farmer 1992:413).

[11]Musgrave (1981:237–39) calls scope conditions "domain assumptions" and attempts thereby to subsume them under assumptions. However, assumptions and scope conditions have different functions in a scientific theory and thus one needs to separate them completely (Cohen 1989; Markovsky 1994).

[12]Even Jasso (1988:5) exhibits some evidence of this confusion in her otherwise brilliant article when she states: "The more general the postulate set, the greater will be the scope of the theory."

[13]Friedman himself did not characterize his argument as instrumentalist, but did in private communication acknowledge that Boland's characterization of it as such is "entirely correct" (Caldwell 1980:226).

In contrast, a *realist* philosophy of science holds that scientific theories are either true or false in some fundamental ontological sense, even though human observers and scientists may not know if a given theory is true (Popper 1994). Realist theories provide causal explanations of observable empirical phenomena by making reference to unobservable entities, structures, and processes (Keat and Urry 1975:27–45). Theories are not mere instruments for the realists; they provide genuine and true (or truer and truer) causal explanations of the empirical world.

The realist view of science is often thought of as a polar opposite of the instrumentalist view (Keat and Urry 1975:63–65). Does that mean that anyone who agrees with Friedman and holds that a theory's assumption set ought to be unrealistic must also be a philosophical instrumentalist and therefore reject realism? I do not believe so. I am a philosophical realist, yet I agree with Friedman's prescription. The reconciliation of the two views hinges on the precise meaning of the term "unrealistic."

In his brief comment on Friedman (1953), Nagel (1963) discusses three different meanings of "unrealistic": (1) "A statement can be said to be unrealistic because it does not give an 'exhaustive' description of some object, so that it mentions only some traits actually characterizing the object but ignores an endless number of other traits also present" (p. 182). In this sense, an assumption set may be unrealistic because it is *incomplete*. (2) "A statement may be said to be unrealistic because it is believed to be either false or highly improbable on the available evidence" (ibid.). In this sense, an assumption set may be unrealistic because it is *untrue*. (3) An assumption set may be unrealistic because its contents are *abstract*, making reference to "pure" cases under "idealized" situations. "Statements of this kind contain what have previously been called 'theoretical terms,' which connote what are in effect the limits of various non-terminating series and which are not intended to designate anything actual" (p. 183).

All theoretical assumptions are unrealistic in Nagel's third sense of being abstract. All assumptions, in fact, entire scientific theories, are stated in an abstract language, using abstract concepts or "theoretical terms," as Nagel (1979:131–34) himself recognizes elsewhere. Thus unrealism of assumptions in this sense of abstractness does not distinguish one theory from another; all theories have assumptions that are "unrealistic" in this sense.

A theory's assumption set can therefore be more or less unrealistic in either Nagel's first (incomplete) or second (untrue) sense.[14] The position that a theory's assumption set ought to be as unrealistic as possible is inconsistent with the realist philosophy of science *only if* the term "unrealistic" takes on Nagel's second meaning of untrue. Since realists believe that scientific theories provide ontologically true causal explanations of underlying processes that produce observable phenomena in the empirical world, they cannot accept any theory that is known to be empirically untrue.[15] If any assumption of a theory is unrealistic in this sense of being contrary to facts, then the theory is fundamentally false from the realist point of view, even if it might produce hypotheses that turn out to be consistent with empirical evidence. Thus "an explanation generated from basic assumptions that are believed to be untrue has no claim to credibility" (Farmer 1992:419; Hedström forthcoming:4).

However, my argument is perfectly consistent with the realist philosophy of science if the term "unrealistic" means "incomplete," Nagel's first meaning, for theories can simul-

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[14]These correspond to Sen's (1980:357–59) definitions of unrealism as departure from "the whole truth" and departure from "nothing but truth," respectively. Sen essentially agrees with my argument here when he posits that economic theory's assumptions may be unreal by "the whole truth" criterion but not by the "nothing but the truth" one.

[15]More precisely, since theories are always evaluated in competition to each other (Lakatos 1970) and since no available theory is likely to be true in the absolute sense, realists must accept the theory that is known to be the truest among all available competitors.

taneously be true and incomplete. In fact, until we have a truly unified general theory that explains everything in the universe, all scientific theories, however true, are necessarily incomplete and partial. And the acceptance of true but incomplete theories is perfectly consistent with the realist view of science.

In my earlier illustration, Assumption set A is more unrealistic than Assumption set B because it is more incomplete. But Assumption set A is not untrue; actors often do seek to maximize their wealth. In fact, Assumption A1 is identical to Assumption B1. If for the moment we assume that each of the nine statements in Assumption set B captures an equal range of empirical reality regarding the values that actors pursue (which may or may not be true, and does not have to be true for my argument to hold), then Assumption set A is equally as true as Assumption set B, but captures only one-ninth of the reality and thus is highly incomplete.

Most of the critics of rational choice theory and game theory I quoted above argue that the assumption sets typically used in these general theoretical perspectives are incomplete.[16] Few critics (if any) would argue that actors *never* behave in a way consistent with utility maximization under *any* circumstance or that actors *never* possess perfect information; few critics, in other words, would argue that the typical assumptions are fundamentally untrue. The critics merely point out that there are *many other* situations when actors do not behave according to the assumptions; the assumptions are thus incomplete (albeit true in a very limited sense) descriptions of human behavior.

When a scientific theory begins with an assumption set that is highly unrealistic in this sense, the assumption set captures a very narrow slice of the empirical reality, but it is a true reality nonetheless. If such a theory can still produce a large number of hypotheses that are accurate descriptions of a wide range of the empirical world, then the theory is simultaneously true (in the sense of being acceptable to philosophical realists), fruitful (in Jasso's sense because "it explains much by little," to use Friedman's words) and incomplete (in the sense that its assumption set is highly unrealistic).

AN ILLUSTRATION: A THEORY OF THE VALUE OF CHILDREN

I illustrate my argument with a recent theory of the value of children by Friedman, Hechter, and Kanazawa (1994; hereafter FHK). FHK note that there is no satisfactory theory of fertility behavior. Normative theories, which explain the historical downward shift in fertility in terms of changing values and norms about children, are extremely ad hoc and unsatisfactory because they treat norms as exogenous and do not specify the mechanisms by which ideological changes affect fertility decisions. Economic theories, on the other hand, which explain the fertility decline in terms of economic incentives, are very elegant and fruitful (having only one value assumption about wealth maximization), yet they cannot explain why individuals in advanced industrial societies choose to have children when their economic costs are highly positive.

FHK offer an alternative *uncertainty reduction* theory of parenthood. This theory posits that individuals have children in order to reduce uncertainty that they face. Those who for various reasons face greater uncertainty are more likely to have children than those who face less uncertainty or those who have other means to reduce uncertainty. From this value assumption, combined with other assumptions, FHK derive various hypotheses that are

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[16]Ritzer and Stolzman say that rational choice theory *ignores* or *downplays* empirical complexity, Alexander notes that its assumptions are *restrictive*, Burk charges that it *fails to provide a sufficiently complex accounting*, Smelser claims that individuals do not *always* act rationally, and Hechter argues that game theory's assumptions are *exceedingly restrictive*. In fact, only Petersen uses the word "wrong" (comparable to Nagel's "untrue") in his critique.

widely supported by available evidence in the demographic literature. The theory has been largely confirmed in an independent empirical test (Wu 1996).

In this theory, FHK postulate only one main value assumption:

Assumption 1. Actors seek to reduce uncertainty.

Since stable marriage is a global strategy to reduce uncertainty, Assumption 1 entails one subordinate assumption:

Assumption 1.1. Married couples attempt to increase their marital solidarity.

These are the only assumptions about actors' values that FHK postulate in this theory; there are no other values that actors are assumed to hold in this theory. Actors in the FHK theory seek one thing only: uncertainty reduction. They do not seek to maximize wealth, or to increase prestige or power; they do not even seek to satisfy hunger and thirst. Because only one value is postulated, the implication is that actors will forgo wealth maximization or hunger satisfaction (or anything else) in their attempt to reduce uncertainty. One might say, to paraphrase Tilly above, that FHK's people live in a refreshingly benign world.

How realistic are FHK's value assumptions? Not at all. This is one of the most unrealistic assumption sets in the social sciences precisely because it is so incomplete. Do FHK believe that in reality actors only possess the values that they have postulated in their assumptions? For instance, do they believe that actors do not maximize wealth or satisfy hunger? Not at all. But they do not postulate other values (and make their assumption set more complete and empirically realistic) because additional value assumptions are not necessary to derive hypotheses. Note, however, that what *is* postulated is not untrue; actors do seek to reduce uncertainty. FHK's assumptions are "nothing but the truth," but not "the whole truth" (Sen 1980:357–59).

Recall that a theory's assumptions are not its scope conditions. If a theory's assumptions define its empirical range of applicability, then the FHK theory has zero applicability because there has been no society in human history in which all actors pursue uncertainty reduction (and nothing else) at all times. FHK specify their scope conditions separately, however (1994:381–82). Their theory is meant to apply to all societies in which net economic costs of raising children are positive. Two specific conditions that create such positive costs of children are mandatory education and child labor laws. Thus the theory applies to most advanced industrial societies.

WHEN ASSUMPTIONS NEED TO BE REVISED:
KOLLOCK'S CRITIQUE OF AXELROD

I have so far argued that a theory's assumptions are and ought to be unrealistic. Thus it is wrong to criticize a theory for its unrealistic assumptions, and it is wrong for a theorist to revise the assumptions to make them more realistic. However, there are certain conditions under which revision of a theory's assumptions is necessary: that is when the set of assumptions (whether unrealistic or not) leads to hypotheses that are not supported by empirical evidence.[17] I will illustrate this point with Kollock's (1993a, 1993b) recent work revising Axelrod's (1984) Cooperation Theory.

Axelrod (1984:3) begins his highly influential work with the question: "Under what conditions will cooperation emerge in a world of egoists without central authority?" His answer, Cooperation Theory, begins with the assumption of perfect information: Actors have perfect information on their own past and current interactions. From this and other assumptions, Axelrod derives several hypotheses, including:

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[17]Recall that empirical support is a more important criterion for assessing theory than its fruitfulness (see note 6 above).

Hypothesis 1.

Actors using Tit for Tat (TFT) strategy do better than those who use other, less contingent and reciprocal strategies.

Hypothesis 2.

Actors using TFT can do better than those using other strategies if and only if they retaliate every single instance of others' defection immediately.[18]

Taken together, Hypotheses 1 and 2 imply that, in an environment where there are heterogeneous actors using different interpersonal game strategies, the most successful ones are those who use strictly contingent and reciprocal strategy. One must never be the first to defect, but if provoked by others' defection, one must retaliate immediately and continuously until they start cooperating again. TFT is a very strict strategy.

Kollock (1993a, 1993b) points out that Axelrod's hypotheses are not consistent with available empirical evidence. All sorts of actors, from friends and relatives (O'Connell 1984), to northern California cattle ranchers (Ellickson 1991), to even capitalist business partners (Macaulay 1963), practice more generous (less strict) "accounting systems" in their relations, yet manage to produce and sustain cooperation. Using Axelrod's own evolutionary logic, the fact that these "relaxed accounting systems" are rampant today means that actors who used them have done better in the past than those who used more "restricted accounting systems." This is contrary to both of Axelrod's hypotheses above.

Kollock argues that the problem might stem from Axelrod's assumption of perfect information. In an informational environment where there is some "noise," a genuinely cooperative behavior might be misperceived as a defective one, or an actor who intended to cooperate might nevertheless end up defecting due to accident or mistake. If all actors employ TFT and other strict accounting systems that mandate immediate retaliation to every instance of defection without exception, any of these unfortunate events triggers a never-ending cycle of mutual recrimination.

Kollock thus revises Axelrod's assumption of perfect information with one that allows for some level of noise, while leaving other assumptions untouched. In a noisy environment, actors employing generous and relaxed accounting systems should outperform those using TFT (and other strict systems) because they are less likely to fall into the trap of mutual recrimination as a result of misperceptions, mistakes, and accidents. Mutually profitable cooperation is more likely to emerge and be sustained between actors using generous and relaxed systems.

His computer simulations (1993a) and subsequent laboratory experiment with human subjects (1993b) support this hypothesis. Kollock's work thus demonstrates that the revised Cooperation Theory, with the assumption of imperfect information, can now explain some empirical "irregularities" reported by Macaulay (1963), O'Connell (1984), and Ellickson (1991), which Axelrod's (1984) original theory could not. Kollock's assumption of imperfect information is more empirically realistic, and thus necessarily larger in number of required statements than Axelrod's singular assumption of perfect information. Kollock must specify when actors' information is perfect and when it is not, and, in the latter, how much the information is distorted and to which direction. Yet such loss of parsimony and fruitfulness is necessary and warranted to produce empirically realistic hypotheses.

CONCLUSION

I have argued that it is wrong for critics to fault a theory for the unrealism of its assumptions, and that it is equally wrong for theorists to revise their assumptions just to make

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[18]Hypothesis 1 is a rephrasing of Axelrod's (1984:59) Proposition 2, and Hypothesis 2 a restatement of his Proposition 4 (p. 62).

them more realistic. A theory's assumptions are, and ought to be, unrealistic because the empirical reality they purport to explain is always highly complex. In order to increase the theory's fruitfulness, theorists must reduce the size of their assumption sets, and as an unavoidable consequence must make the assumptions more and more incomplete (and thus unrealistic) as descriptive statements of complex empirical reality. It is in this sense that a theory with more unrealistic assumptions is better than one with more realistic ones, because the former is necessarily more fruitful than the latter, *ceteris paribus*. Although this position, originally promoted by Friedman (1953), is often associated with the instrumentalist philosophy of science, it is nonetheless perfectly consistent with the realist philosophy if one takes "unrealistic" to mean "incomplete" rather than "untrue."

Many criticisms about unrealistic assumptions stem from the critics' confusion of assumptions and scope conditions. FHK (1994) show how empirically plausible and realistic hypotheses can be logically deduced from highly unrealistic assumptions, but still applicable to a wide range of empirical situations specified in the scope conditions. Kollock (1993a, 1993b) shows why the revision of assumptions is sometimes necessary to make a theory's hypotheses consistent with available empirical evidence.

The history of modern physics provides another example of the need to revise assumptions in order to produce hypotheses that are consistent with empirical observations. Newtonian classical mechanics begins with the assumption that time is absolute and universal, although Newton himself realized even at the time of the publication of *Principia* in 1687 that this assumption was unrealistic: "Absolute, true, and mathematical time, of itself and from its own nature, flows equably without relation to anything external" (quoted in Lindley 1993:59). However, this unrealistic assumption was retained in classical mechanics for the next two hundred years because all of its predictions were supported by experiments during that entire time period. It was not until the famous Michelson-Morley experiment of 1887 that empirical evidence began to contradict the predictions of classical mechanics. Then, in 1905, Einstein substituted the assumption of absolute and universal time with one of relative and personal time in his special theory of relativity, which was then able to account for the results of the Michelson-Morley experiment as well as all the predictions of classical mechanics.

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