

Econometrics and the Truth-Seeking Assumption: Ethics and Research Independence

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To be presented at the Southern Economic Association meetings in Tampa in November 2001. A CD with JPG and TIF files of the Fleeming Jenkin diagram of exchange is available upon request from the authors. The scans are detailed enough to reveal the pencil makings.

Two Orders

The anomaly does not disturb the placidity of textbook accounts, but the remorseless logic of self-seeking economic calculation stops at the edge of economic theorizing. The economic theorists are supposed to have motives other than those which characterize the ones we study. We who study self-seeking behavior are supposed to be truth-seekers. The term “philosopher” is Greek for “lover of wisdom.” As truth is the paradigmatic public good, there is no immediate, direct link to our self-seeking behavior. What might be the alternative to the truth-seeking assumption? We propose that economic theorizing can be most usefully modeled as an act of exchange and the theorists have the same self-interested motives as those we theorize about. We are who we study. And when we forget this we find ourselves in difficulties.¹

Our argument below concerns econometric theory and practice. Econometrics is the cross-road from pure theory to that entity which is sometimes called the real world. The bridge between the platonic world of pure mathematics and the real world is, we shall argue, something described in choice-theoretic terms. The truth-seeking assumption in econometrics

¹Smith (1776, p. 28): “The difference of natural talents in different men is, in reality, much less than we are aware of; and the very different genius which appears to distinguish men of different professions, when grown up to maturity, is not upon many occasions so much the cause as the effect of the division of labour. The difference between the most dissimilar characters, between a philosopher and a common street porter, for example, seems to arise not so much from nature as from habit, custom, and education. When they came into the world, and for the first six or eight years of their existence, they were perhaps very much alike, and neither their parents nor playfellows could perceive any remarkable difference. About that age, or soon after, they come to be employed in very different occupations. The difference of talents comes then to be taken notice of, and widens by degrees, till at last the vanity of the philosopher is willing to acknowledge scarce any resemblance.”

seems to us to explain the otherwise curious lack of a code of econometric ethics. There is, after all, a long tradition of codes of ethics in mathematical statistics, ASA 2000 being only the latest from the American Statistical Association.² Codes of ethics can be viewed as attempts to modify the behavior of those for whom there is a difference between their interests and the interests of others.³ Recognition of the prisoner's dilemma is the mark of the human.⁴ The point of the paper is that we are subject to the prisoner's dilemma whether we recognize this or not. The truth-seeking assumption obviates the need for a code of ethics because truth is a pure public good. There can be no difference between what is in our interest and the public interest.

We shall argue that this self-serving belief has drastic consequences. When we believe that everyone else is a truth seeker, and thus the literature will be free from gross, systematic error, we can free-ride on their efforts. This free riding destroys the conditions necessary to

²Gorlin (1999), an 1100 page compendium of "codes of professional responsibility," indexes professions alphabetically. There is chiropractic (1067), computing (1068), counseling (1070), dental hygiene (1073), dentistry (1074), direct marketing (1076), dispute resolution (1078), engineering (1079). Professionals whose discipline begins with the letters "ec" might note the absence.

³Levy-Pearl 2001a explores David Hume's "Other Rational Species" problem which Hume considered far more difficult than the prisoner's dilemma. The prisoner's dilemma, he thought, could be handled by either an evolutionary process (as it is called together) or by moral motivation. The "Other Rational Species" problem occurs when the Other, unlike the partner in the prisoner's dilemma, is incapable of imposing costs on Us.

⁴Aristotle *Politics* i.2 [1253]: "He who by his nature and not simply by ill-luck has not city, no state, is either too bad or too good, either sub-human or super-human— sub-human like the war-mad man condemned in Homer's words 'having no family, no morals, no home'; for such a person is by his nature mad on war, he is a non-cooperator ... For the real difference between man and other animals is that humans alone have perception of good and evil, right and wrong, just and unjust. And it is the sharing of a common view in these matters that makes a household or a city." Adam Smith's linking of trade to "reason and speech" is rather often ignored by modern economists (Levy 2001b; Levy-Pearl 2001b).

establish freedom from systematic error.

Econometrics has long been seen as the most narrowly scientific aspect of economics. As such it would seem to be subsumed by what may be the controlling “linear” image of the scientific process.⁵ To mangle “Newton’s” metaphor, we see better than our giant predecessors because we stand on their shoulders.⁶ In the image the only goal visible is that of insight. What is desired is clarity into how the world works. The fact that we are able to see farther than others is purely an accident of history: we come after them. Reverse the order and they would see farther than us. Consider two scientists, G and D. The truth which each of them can recover individually is $T(G)$ and $T(D)$. Add their efforts together, then the scientist D who can use the efforts of G, thus $D|G$, can find more truth. In particular $T(D|G) = T(D) + T(G)$. If truth is all that matters to both D and G then we have “solved” the problem of the public provision of public goods by assuming that our individuals wish, and only wish, to produce the public good of truth.

What if scientific progress is not a linear affair in which the past is nested in the present, but rather zig-zags, improving in the main but with some local losses?⁷ Schumpeter’s

⁵Kuhn (1962) challenged the linearity of science without questioning the truth-seeking assumption; rather, he made “truth” relative to a “paradigm.” The self-interest of scholars may be an easier concept to make operational than a scientific paradigm.

⁶Merton (1985) is a playful scholarship without rival. It is worthy of remark Merton’s path-breaking articles on priority fights in science, collected in Merton 1977, emphasize that science is conducted by scientists with more than a casual interest in being rewarded for their discoveries.

⁷Scalar neoclassical welfare analysis is invariably in terms of the *mean* well-being while the classical analysis of Adam Smith (Levy 2001b) and T. R. Malthus (Hollander 1997) was in terms of the *median*. As there is an ongoing debate about whether to use the mean or the median, we should not wish to take sides now. A loss occurs when we read Smith’s inference from the well-being of the

unrivaled mastery of the history of economics leads him to the zigzag hypothesis in which one cannot evaluate the present without knowledge of the past.⁸ Although Schumpeter believes the history of science “teaches us much about the ways of the human mind” (1954, p. 5), he does not give the microfoundations of the zigzag process. Indeed, he asserts that the motivation of scientists is totally irrelevant to science. It makes no difference whether the scientist is a truth seeker or a hired expert; science is objective.⁹

But if the problem is to explain the systematic error, the zigs and the zags, then perhaps the motivation of scientists are important. What is the alternative to the truth-seeking assumption? We propose to remember that we are economists and explain theorizing as a

majority to the well-being of society and conclude that he forgot to take into account the well-being of the rich minority!

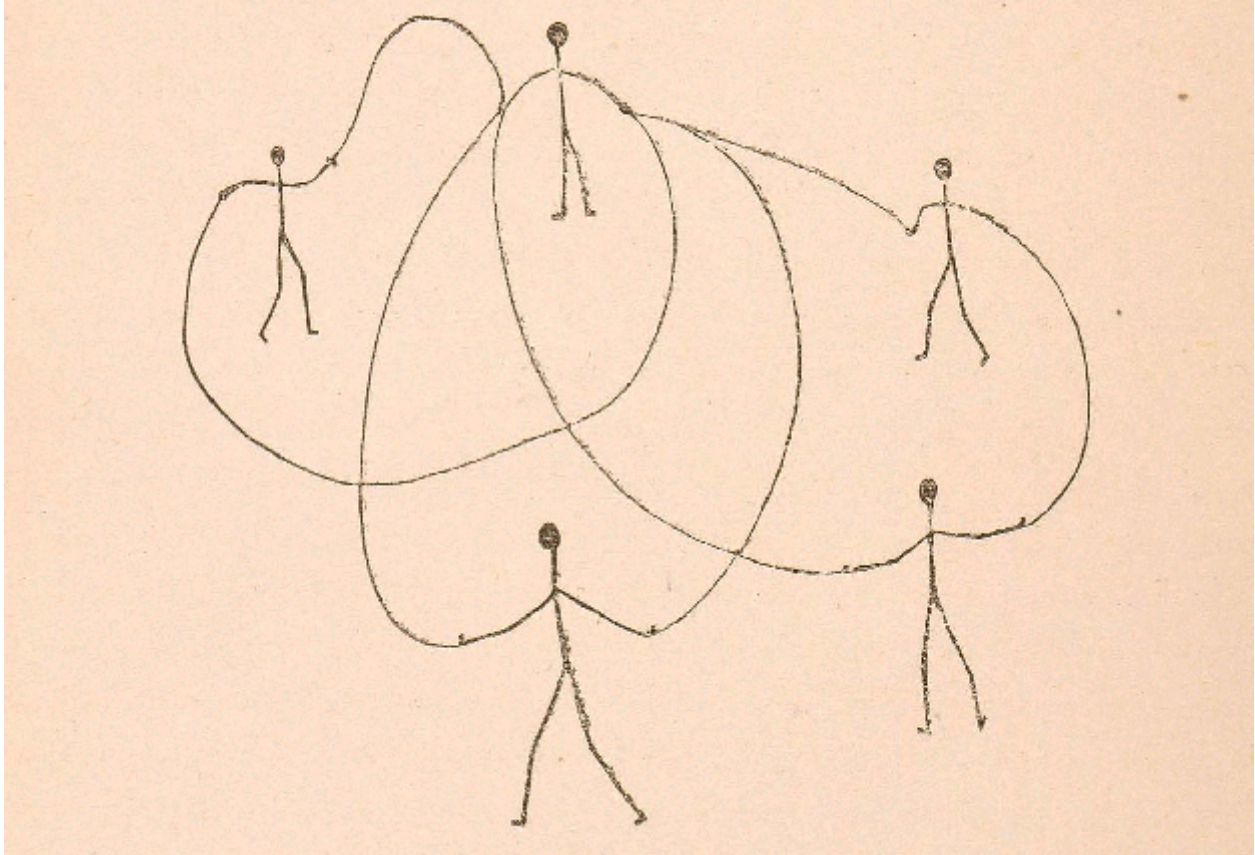
⁸“... whatever the field, the problems and methods that are in use at any given time embody the achievements and carry the scars of work that has been done in the past under entirely different conditions. The significance and validity of both problems and methods cannot be fully grasped without a knowledge of the previous problems and methods to which they are the (tentative) response. Scientific analysis is not simply a logically consistent process that starts with some primitive notions and then adds to the stock in a straight-line fashion. It is not simply progressive discovery of an objective reality -- as is, for example, discovery in the basin of the Congo. Rather it is an incessant struggle with creations of our own and our predecessors' minds and it 'progresses', if at all, in a criss-cross fashion, not as logic, but as the impact of new ideas or observations or needs, and also as the bents and temperments of new men, dictate. Therefore, any treatise that attempts to render 'the present state of science' really renders methods, problems, and results that are historically conditioned and are meaningful only with reference to the historical background from which they spring. To put the same thing somewhat differently : the state of any science at any given time implies its past history and cannot be satisfactorily conveyed without making this implicit history explicit.” (Schumpeter 1954, p. 4).

⁹“...our definition [of science] implies nothing about the motives that impel men to exert themselves in order to improve upon the existing knowledge in any field. .. we only note that the scientific character of a given piece of analysis is independent of the motive for the sake of which it is undertaken.” (10). ... “This implies that any arguments of a scientific character produced by 'special pleaders' -- whether they are paid or not for producing them -- are for us just as good or bad as those of 'detached philosophers,' if the latter species does indeed exist.” (11)

trade. Thus, we propose to bring the theorist within the katallactic circle of economics.¹⁰ We use “circle” in a non-metaphorical sense. Over one hundred years ago when Fleeming Jenkin explained the logic of exchange, he drew a picture of the circular order which results from trade. The nonlinearity results from each individual pursuing her own interests. This image has been neglected so we reproduce it.¹¹

¹⁰Such economists as Adam Smith, Richard Whately and F. Y. Edgeworth proposed starting social analysis with two individuals trading. Whately proposed calling political economic “katallactics” after a Greek word for reciprocity and exchange.

¹¹Jenkin (1887, 2:150). The context of Jenkin’s diagram of exchange is his opposition to the argument of the literary commonplace that trade is zero sum.



We propose to contrast this circular order of exchange with the linear order studied by Rubinstein (1996 & 2000). We propose to use the machinery we develop to address the problem whether science progresses in some linear fashion, best explained by truth-seeking, or whether it zig-zags, best explained by periodic systematic error.

The Econometrician's Dilemma in the Reporting of Estimates

What does the econometrician want? Bayesian theory as explained by Savage (1972) depends upon the understanding of the rational individual as presented in the axioms of behavior given by von Neumann-Morgenstern (1964).¹² The von Neumann-Morgenstern

¹²This is emphasized at Posner (1999, p. 1479): "... the theory of rational choice that underlies both mathematical probability theory and economic theory ..."

axioms are a specification of the choice of an isolated individual. How do we move from what is true of an isolated individual to a social context?¹³

The simplest possible model of social behavior is a two-person model.¹⁴ The policy studied in the literature is a jury decision where each side hires an expert econometrician to press its case. If as has been supposed the money awarded in a case depends upon the point estimates accepted by the jury, then an estimate biased in one direction will be preferred by the employer of the expert to an unbiased one.¹⁵

This simple formulation motivates the act of estimation in such a way as to open a divergence between private and social interest. When there is only one individual in the society, the distinction between private and social interest vanishes. When there are two individuals, the distinction between private and social interest is completely familiar. In this context we consider the role of statistical ethics as a constraint on the game of social policy.

Rational choice research, that conducted for the private benefit of the researcher, has long been the subject of econometric folk wisdom — “data torture” is a familiar term — and

¹³“Bayesian statistics has no formal reason to recommend randomizations at all. Yet there are important, but as yet ill formulated, reasons having to do with self discipline and interpersonal relations.” De Finetti (1972, p. 146). I am indebted to Diaconis (1998) for showing us these hard words in terms of open problems in Bayesian theory.

¹⁴The von Neumann-Morgenstern axioms are an elegant statement of the position that economics ought to start with one individual optimizing and thus are at foundation opposed to katalactics. Levy-Perart 2001a describes the differences between the two approaches with some attention to the sort of social dilemma encountered below.

¹⁵Posner (1999, p. 1488): “Because trial lawyers are compensated directly or indirectly on the basis of success at trial, their incentives to develop evidence favorable to their client and to find the flaws in the opponent’s evidence is very great and, if it is a big money case, their resources for obtaining and contesting evidence will be ample.”

more recently the subject of technical scrutiny, e.g., Leamer (1983), Denton (1985). Feigenbaum-Levy (1996) propose a simple rational choice model research in which a researcher has preferences over outcomes which can be effected by systematic under-reporting of results. Figure 1 reproduced from Feigenbaum-Levy describes this model.

The indifference curves describe the preferences of the econometrician (or the employer of the econometrician) for reported estimates. Both bias in one direction and efficiency are supposed desirable. Two constraints are pictured – an inner shaded polygon and an outer unshaded polygon. These constraints, the replication sets, can result from computing a number of even unbiased estimates and selecting the most pleasing combination of bias and efficiency. The rational choice estimate, rc , will be the solution to the econometrician's optimization problem. In Figure 1, rc^* results when the constraint is tighter, rc^{**} when the constraint is looser.

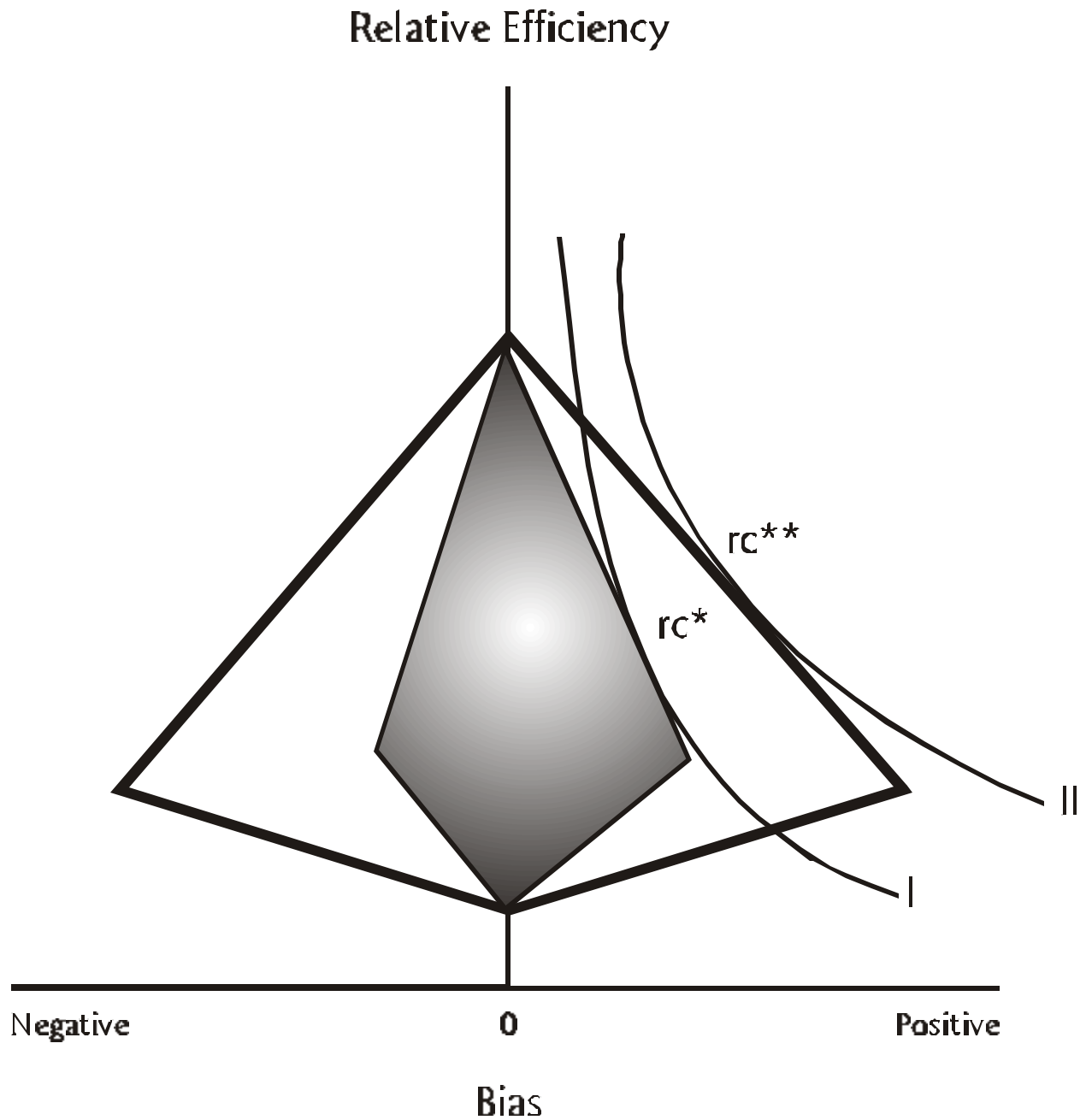


Figure 1. Replicable Optimal Estimate

Such rational choice estimation is the evil twin of exploratory data analysis [EDA].

Whereas EDA supposes that a model changes as one's beliefs move to encompass more of what is true (Levy 1999/2000), rational choice estimation starts with a true model and finds what is profitable to believe. The American legal system seems an ideal case to consider such rational choice estimation in a competitive context.

We have described the rational choice estimator b of a parameter θ employed by statistician s . We suppose that s 's understanding of the first moment of b is $E(b)^s$. The estimate is *transparent* if for any reader t , $E(b)^s = E(b)^t$ and non-transparent when the equality fails.¹⁶ The definition can be generalized to an arbitrary moment. If moments do not exist transparency is attained if both writer and reader understand the failure of absolute convergence. A transparent estimate can of course be biased.¹⁷ Transparency is thus intimately related to the ethical property of impartiality as a rule or judgment is said to be impartial if it is applied without regard to personal identity.¹⁸

Earlier students of the economics of expert witnesses have supposed that the jury decision will be made on the basis of an average of such biased estimates. The conclusion of Froeb and Kobayashi (1996) for the case of biased experts before a jury, the average of their estimates will be unbiased. In this they are followed by Posner who contends that this property

¹⁶So defined non-transparency is a case of asymmetric information (Akerlof 1970).

¹⁷In the discussions leading up to the American Statistical Association (2000), great care was taken to distinguish an estimate in which the bias is transparent, as defended by Bayesians, from an estimate in which the bias is not transparent.

¹⁸"Impartiality" is famously emphasized in Adam Smith's spectator theory of morality in which the "impartial spectator" is the goal of moral education. It is worthy of notice that spectator theories of morality allow such statistical questions as robustness to be addressed, Levy 2001b.

of a competitive procedure makes the idea of a court-appointed expert witness unwarranted.

The use of a court-appointed expert is problematic when (for example, in the damages phase of the case) the expert witness's bottom line is a number. For then, in the case of opposing witnesses, the trier of fact can "split the difference," after weighting each witness's estimate by its plausibility. Posner (1999, p. 1539)

The point of Levy 2001a is that such a conclusion ignores the prisoner's dilemma in the statistical context. While it is in the interest of each statistician considered separately to engage in selective under-reporting of results, it is in the interest of the statisticians considered as a group not to under-report. A context in which both statisticians engage in bias-seeking behavior has lower statistical efficiency than they restraint themselves. The technical point is simple minded in the extreme. While bias might well "average out," variance does not.

Econometrics as Katallactics

The key to the difference between the foundations of exchange in the classical period and those of the neoclassical period is the importance given to reciprocity (Levy 2001b, Levy-Peart 2001b). Richard Whately's proposal to call our discipline the science of exchange carries with it the notion of reciprocity since that is carried in the Greek of "katallactics." By reciprocal behavior, a circular order is linearized.

We sketch a "moral" approach to the prisoner's dilemma – the introduction of approbation – and show how statistical ethics modifies the prisoner's dilemma.

We require a modest collection of logical symbols, \neg (not), \supset (if ... then ...), \vee (inclusive or), \wedge (and). The states of the social world we denote by lower case letters in

italics, thus, $a, b, c \dots$. In the case of certainty, we mark the material income at each state of the world, $a, b, c \dots$, as $X(a), X(b), X(c)$ and similarly for approbation, $A(a), A(b), A(c)$.

When the choices involve probabilities, we suppose that we can define both expected material income and expected approbation. Economizing on parentheses, these are respectively $EX(a), EX(b), EX(c)$ and $EA(a), EA(b), EA(c)$. To minimize the employment of square brackets as statement separators, we employ the convention that the relation $>$ binds more tightly than the logical operators \mathbf{W} and \mathbf{V} .

A valuable piece of neo-classical notation, aPb , is sometimes read as a hypothetical assertion that if a decision maker were given a choice between a and b , a would be chosen. Here, aPb is used in a revealed preference sense, meaning that we observe an individual selecting a when b is observed to be feasible. We have no access to subject states so it is our responsibility to specify why this choice was made. What imputation is reasonable? The necessary condition of katalactic rationality [= KR] we require is that one does not turn down a bundle with both more expected material income and more expected approbation. Thus:

$$aPb \mathbf{\textcircled{6}} [EX(a) > EX(b) \mathbf{W} EA(a) > EA(b)].$$

The left-hand side of $\mathbf{\textcircled{6}}$ is an observed choice; the right-hand side is something which we can go out and measure. KR requires only that if a is chosen over b there cannot be more of both material income and approbation at b than a .

How does this relate to neo-classical assumptions? The relation is very straightforward: a choice is KR if it does not violate the weak revealed preference axiom that more is preferred to less. A bundle is KR if there isn't any other bundle which dominates it in the space of *both*

material income and approbation.

Adam Smith claimed that a reciprocity norm is central to the social order. The traditional prisoner's dilemma logic makes it easy to operationalize such a reciprocity norm: if there are two choices confronting each of two individuals, no less approbation is earned when their strategies match — the diagonal elements of the prisoner's dilemma — than when their strategies do not match — the off-diagonal elements. We let A_1 be the approbation from reciprocal strategies and A_0 be the approbation from non-reciprocal strategies and we require that $A_1 \geq A_0$.¹⁹

The condition that $A_1 = A_0$ — which we allow — corresponds to the case where approbation is not in fact part of the game. We suppose that this condition occurs when the agents regard themselves of different and unconnected races. If you are a dog and I am cat, I hardly care about your opinion of me. The condition of $A_1 > A_0$ corresponds to the case where approbation is earned by, and only by, the relation between one's play and that of the other players. We suppose that this condition comes when the agents regard themselves in the same race.

As is commonplace, we consider two individuals with each of two strategies: "Transparent" or "Non-Transparent." We depart from the convention by adding the

¹⁹It is straightforward to add the case of *three* level of approbation where the approbation differs in the diagonal elements, e.g, the approbation from both co-operating is higher than the approbation from both non-co-operating. This specification would be a natural way to handle the complication that approbation is sensitive to income so that the higher income from co-operation brings with it higher approbation.

approbation from the spectator's judgment produced by a reciprocity norm.²⁰

Matrix 1: Prisoner's Dilemma		
Material Income and Approbation		
	Column Transparent	Column Non-Transparent
Row Transparent	$(3, A_1), (3, A_1)$	$(1, A_0), (4, A_0)$
Row Non-Transparent	$(4, A_0), (1, A_0)$	$(2, A_1), (2, A_1)$

Matrix 1 contains the familiar prisoner's dilemma where the usual facts of income from various decisions are supplemented by the approbation one obtains from following a norm of reciprocity. Thus, if both players are statistically transparent then both will receive 3 units of income and A_1 of approbation. If both players are non-transparent then although their income falls to 2 each, the approbation is unchanged because they have acted in accord with the reciprocity norm. However, in the off-diagonal cells, the reciprocity norm is violated and both parties are judged harshly. While the one who under-reports might be judged a "jerk," the one who continues to report transparently is judged a "sucker."

Is KR satisfied by the two strategies? The game being symmetric, we need only consider one player. Let us suppose that the player believes that the probability of his partner's transparency is p and that he is well-enough informed to believe that the probability of non-

²⁰The internalization of reciprocity means that monitoring issues are automatically solved.

transparency is therefore $1-p$. We can solve for his expected income and the expected approbation of the two strategies:

$$EX(\text{Transparent}) = pA_3 + (1-p)A_1; EA(\text{Transparent}) = pA_{A_1} + (1-p)A_{A_0}$$

$$EX(\text{Non-Transparent}) = pA_4 + (1-p)A_2; EA(\text{Non-Transparent}) = pA_{A_0} + (1-p)A_{A_1}$$

There are two interesting cases — $A_1 = A_0$ and $A_1 > A_0$ — which we consider in turn.

Case 1. $A_1 = A_0$. For any p , $0 \neq p \neq 1$, only Non-Transparent satisfies KR. Non-Transparent always has more expected income and never has any less approbation than Transparent, so it satisfies KR. And, importantly, Transparent does not.

Reciprocity Linearizes

We have all the pieces to our case that reciprocity linearizes the circular order of exchange. As long as the off-diagonal elements are eliminated, then each individual's private calculation will produce common movement. Pareto-preferable is a linear order.

We should not be understood to claim that moral consciousness is sufficient to solve prisoner's dilemma issues. The American Statistical Code of Ethics (ASA 2000) has teeth because an expert witness who is detected violating the transparency norm can lose the case for his client.

Preferences Over Inputs, Free-Riding and Systematic Error

Let us confront the obvious objection to any attempt to extend an analysis of expert witnesses to scholarship in general. While the desires of expert witnesses can be expected to correspond closely with those who pay them to testify, this surely cannot be the case of

scholars in general.²¹ Let the literature be composed of N scholars, only K of whom have the sort of biases described by Figure 1 above, the other N-K have no presuppositions. To make the problem transparent suppose that each of the I scholars in the literature report estimates b_i of parameter θ . Let us stipulate that N-K scholars' estimation procedure is median-unbiased; thus, $p(b_i > \theta) = p(b_i < \theta)$ (Levy 1992) although we suppose that the estimation procedure employed by K scholars is median-biased, thus $p(b_i > \theta) > p(b_i < \theta)$.

As long as N grows relatively to K then the problem of biased scholarship would seem to be restricted to that of a small research community. Moreover, if everyone in a research community comes to a common conclusion, we cannot have the problem of biased scholarship! One-sided biased scholarship would reveal itself with a larger than expected number of scholars on one "side" of an issue.²² Here, by assumption, everyone agrees. There

²¹Schumpeter has interesting things to say about "Special Pleaders" as well as ideological bias (1948, p. 37). His optimistic conclusions seem to depend upon a large number of researchers and research independence: "Our only comfort is in the fact that there is a large number of phenomena that fail to affect our emotions one way or the other, and that therefore look to one man very much as they do to another. But we also observe that the rules of procedure that we apply in our analytic work are almost as much exempt from ideological influence as vision is subject to it. Passionate allegiance and passionate hatred may indeed tamper with these rules. In themselves these rules, many of which, moreover, are imposed upon us by the scientific practice in fields that are little or not at all affected by ideology, are pretty effective in showing up misuse. And what is equally important, they tend to crush out ideologically conditioned error from the visions from which we start. It is their particular virtue, and they do so automatically and irrespective of the desires of the research worker. The new facts he is bound to accumulate impose themselves upon his schema. The new concepts and relations, which somebody else will formulate if he does not, must verify his ideologies or else destroy them. And if this process is allowed to work itself out completely, it will indeed not protect us from the emergence of new ideologies, but it will clear in the end the existing ones from error." (1954, p. 43).

²²Stigler (1963) notes that econometric results are checked asymmetrically. If they agree with one's presuppositions they are less likely to be scrutinized than if they do not agree.

is no side, there is no debate. Consensus is the best evidence of truth.

This optimistic conclusion tacitly assumes that the scholars' research is *independent* and that the binomial or multinomial distribution can be applied to compute the probabilities. An essentially trivial violation of research independence will occur when scholars have preferences over inputs, in particular, when their time is valuable (Feigenbaum-Levy 1993), and instead of doing their own research they rely upon the results of others.

If I believe that you are a truth-seeker without preferences over inputs then I can free-ride on your scholarship. If you believe that I am a truth-seeker without preferences over inputs then you can free-ride on my scholarship. If both of us believe this then the belief is self-destructive.²³ To see this, put the K biased scholars at the front of the sequence. The $K+1$ scholar, assuming truth-seeking, simply repeats what he has been told. The $K+1$, the $K+2$ and so on are unbiased scholars without preferences over outcomes. As they have preferences over inputs, they prefer to let others do their research for them. And so the information cascades. Moreover, the $K+1$ scholar testifies that this belief is not the result of presuppositions. Our conclusion is more in keeping with Schumpeter's zigzag view of science than Stigler's linear view.²⁴ The differences between Schumpeter and

²³Robin Hanson contributed this nice term when he was asked what is the opposite of a "self-fulfilling prophecy." The term "self-consuming artifact" which Stanley Fish has used to considerable effect seems synonymous.

²⁴Stigler (1969) is the important statement of the view of the "efficient market" in ideas view. It is worthy of note, perhaps, that Stigler's decade-spanning criticism of the Austrian view of capital theory was on the issue of time preference, which Stigler viewed as akin to the assertion of systematic

Stigler is worthy of note because neither of them took the scholar's vanity of truth seeking seriously.

Systematic error comes from free-riding, the textbook case of failure of reciprocal behavior.²⁵ Can we produce a real world example of this sort of failure? Consider the problem of “estimating” from what direction the classical economists were attacked in the 19th century. The common belief that the “dismal science” tag had something to do with Malthus's theory of population is evidence of a common belief that the attack on classical economics came from its left. No. The “dismal science” tag came because economists were part of the anti-slavery coalition (Levy 2001b, Levy-Pearl 2001b). The attack came from the right. The literature has the signs wrong.

error (Levy 1995).

²⁵Levy (2001b) semi-faciously explains system error by a belief in “no systemic error.” A belief in truth seeking is rather more important than a belief in “no systematic error.”

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