



# Katallactic Rationality: Language, Approbation, and Exchange

## Introduction

Why is it that when subjects in prisoner-dilemma experiments can talk, they cooperate more than when they cannot (Isaac and Walker 1988)? There is nothing in the logic of neoclassical economic theory suggesting this regularity. In search of an answer to this puzzle, I propose to consider the claims advanced by Adam Smith in the *Wealth of Nations* that linked trade and language.<sup>1</sup> Perhaps in Smith's analysis we can find hints toward a solution to the experimentalist's puzzle of the link between cooperation and language.

In *Wealth of Nations*, Smith begins his analysis of choosing agents by considering two individuals exchanging, not an isolated individual optimizing against an impersonal nature. Indeed, it was in his commentary on Smith's account that Richard Whately in his Oxford lectures coined the term *catallactic* from one of the Greek words for exchange, *καταλλάττειν*.<sup>2</sup> To emphasize that exchange is a social act, as he proposed this name for political economy, he simultaneously asserted that an isolated individual, Robinson Crusoe in partic-

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1. "Whether this propensity be one of those original principles in human nature of which no further account can be given; or whether, as seems more probable, it be the necessary consequence of the faculties of reason and speech, it belongs not to our present subject to inquire. It is common to all men, and to be found in no other race of animals, which seem to know neither this nor any other species of contracts. Two greyhounds, in running down the same hare, have sometimes the appearance of acting in some sort of concert. Each turns her towards his companion, or endeavours to intercept her when his companion turns her towards himself. This, however, is not the effect of any contract, but of the accidental concurrence of their passions in the same object at that particular time. Nobody ever saw a dog make a fair and deliberate exchange of one bone for another with another dog. Nobody ever saw one animal by its gestures and natural cries signify to another, this is mine, that yours; I am willing to give this for that" (*WN*, 25). The relationship between modern experimental research and Smith's texts is discussed in Levy 1992. Chapter 11 considers Smith's research in linguistics.

2. I see no good reason to maintain nineteenth-century conventions that transliterate the Greek  $\kappa$  into a  $c$  instead of a  $k$ .

ular, was outside the purview of our discipline.<sup>3</sup> So began the katallactic moment in economics, that period, long dead, buried and forgotten, in which economists modeled humans as inevitably social beings. It is completely in this spirit that F. Y. Edgeworth wrote in *Mathematical Psychics* of the “isolated couple, the catallactic *atom*” (1881, 31), but, famously, Edgeworth explained cooperation without reference to language and turned katallactics into economics.<sup>4</sup>

For all good things, there is a cost. That is economics in one lesson. We who teach this notion in the space of commodities ought not to be deeply surprised if the thought is pursued into the space of economic models describing the choice of commodities. If we take an isolated individual as the foundation of economic modeling, we cannot take two individuals trading as the foundation. The cost of a Robinson Crusoe model is a katallactic model foregone. To make the cost clear, we consider katallactics before Edgeworth.

### Katallactics or Robinson Crusoe?

With katallactics, the model gains access to the judgment of the spectator. The judgment of the spectator, which is itself a model of conduct, offers approbation for choice in accord with the judgment.<sup>5</sup> As I reconstruct the pre-Edgeworth katallactic approach, approbation is something that people value. If they do not, the katallactic model collapses into a Robinson Crusoe model. We can appreciate the importance of this empirical specification by noticing how Smith in *Theory of Moral Sentiments* emphasizes that the desire for approbation is central to the sociability of humans:<sup>6</sup>

Nature, when she formed man for society, endowed him with an original desire to please, and an original aversion to offend his brethren. She taught him to feel pleasure in their favourable, and pain in their unfavourable regard. She rendered their approbation most flattering and most agreeable

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3. “A man, for instance, in a desert island, like Alex. Selkirke, or the personage his adventures are supposed to have suggested, Robinson Crusoe, is in a situation of which Political-Economy takes no cognizance” (Whately 1831, 7). As far as I know, only James Buchanan (1979, 27) in this century has pointed out the relevance of Whately’s resistance to Robinson Crusoe models.

4. When Edgeworth pointed out the incoherence of the slogan “the greatest happiness for the greatest number” and formalized utilitarianism as the norm of maximizing the *average* happiness (Edgeworth 1881, 116–17), Smith’s concern for the majority, the happiness of the *median*, dropped out of sight (see chapter 9).

5. Some details of the idea that “moral” judgment reflects the economic ideas of ordinary people, that is, those agents who are the subject of formal economic models, are carried out in Levy 1992.

6. Studies of nonhuman primate sociability emphasize the role of approbation carried by grooming (*ibid.*, 25–26, gives references). The approbation carried by language may have more than an arm’s reach.

to him for its own sake; and their disapprobation most mortifying and most offensive. (116)

Language comes into the account because approbation is carried by language. Experimental contexts that allow talking between subjects make it easier to exchange approbation.

If we are going to suppose that individuals value approbation, it is surely a good idea to find out how approbation is supposed to be earned. To that task, we turn our attention.

### Regularities of Approbation

What did Whately mean by his katallactic proposal? If he had proposed “exchangeology” the meaning would be obvious to us. But he didn’t; he used a Greek word. When we, in the waning of the twentieth century, discuss a nineteenth-century proposal to apply a Greek word to the discipline, we might worry if we catch the full meaning of the enterprise by giving one English word as a sufficient translation. Classical Greek, like modern English, has many words for *exchange*. Is there any connotation carried by this one?<sup>7</sup>

Let us therefore consider what an older generation of historians of economics, who grew up with Greek, have said about Whately’s proposal. It seems that mainly they ask the sensible question: why it did not catch on?<sup>8</sup> Of particular note is Joseph Schumpeter’s discussion. While comparing the broad Continental meaning, “political economy,” with the narrow “English” meaning—“economic theory”—he has this to say:

Realizing the danger that lurked in this terminology, Archbishop Whately made the unsuccessful suggestion: to replace the term Political Economy *in this sense* by the term Catallactics—from *καταλλάττειν*, to exchange. In this he showed his usual good sense. But having failed to make his meaning clear, he himself was misunderstood and thus made matters worse. The reader will not have to tax his imagination very heavily in order to visualize how this must have struck critics: What!—Political Economy, the science of the economic fate of humanity, entirely reduced to a miserable theory of bargaining! (1954, 536)

7. There is also a problem when, as in the present case, we propose to take a word from a such grammatically rich language as Greek and move it to a vocabulary-rich language such as English. If there are fewer words in Greek than English, then the grammar will be required to convey meaning (see chapter 11).

8. Karl Pribram (1983, 172): “He proposed to apply quite generally to political economy the expression ‘Katallactics,’ or the science dealing with exchanges. But that proposal was too subtle to find significant approval.” Ludwig von Mises seconded Whately’s proposal (1949, 3).

Schumpeter's command of the texts hardly ever fails—this was precisely the response of people like John Ruskin to “catallactics,” as a quick trip to the *Oxford English Dictionary* will attest.<sup>9</sup> Schumpeter's sympathy fails him, and thus he fails the reader, rather more frequently. He seems not to have caught the importance of Whately's variation on a common theme of Aristotle and Smith in his definition of *human* as “an animal that makes exchanges” (Whately 1831, 6). “Miserable” bargaining is the fate of humanity itself.

Schumpeter's erudition was unique, but there is more to scholarship than a single individual's knowledge and memory. Only F. A. Hayek, in his old age, seems to have had the patience to look up the Greek in that century-spanning cooperative venture of classical scholarship, Liddell-Scott-Jones's *Greek-English Lexicon*, and report some of the family of meanings carried by the grammatical inflections available in Greek.<sup>10</sup> Liddell-Scott-Jones gives the adverbial form, *καταλλάγην*: *reciprocally*. Then, from classical times—“exchange, esp. of money then change from enmity to friendship, reconciliation”—and, from the Christian Era, Saint Paul's “reconciliation of sinners with God” (2 Corinthians 5:18).

Although in English we can “exchange” with nature, this notion of apersonal exchange seems foreign to the meaning carried by *katallactics* since Robinson Crusoe could “exchange” with nature.<sup>11</sup> These connotations, the emphasis on reciprocity, prepare us for what Smith tells us about the workings of judgments that carry approbation. Prefatory to his section on justice and remorse (*Theory of Moral Sentiments*, 82–91), Smith emphasizes reciprocity:

As every man doth, so shall it be done to him, and retaliation seems to be the great law which is dictated to us by Nature. (82)

The norm of reciprocity is embodied in rules of justice, so Smith gives the disapprobation one feels from violating these rules great stress. In the next passage we quote, Smith describes how a moral agent—someone who has learned to view his or her past action with the gaze of a disinterested spectator—will view his or her past violations of the norms of justice:

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9. Schumpeter (1954, 483) warns the reader that he has not seen the first edition, only the 1855 edition. This no doubt explains his trivial confusion of the timing—Whately was not archbishop when he made the proposal. The 1831 edition lists him as principal of St. Alban's Hall and a professor of political economy at the University of Oxford.

10. Hayek 1976, 108, 185. Hayek proposes that a market order be called a “catallaxy” for precisely the reason that the market will reconcile former enemies. Albert Hirschman's dismissal of Jacob Viner's demonstration of the ancient roots of the *doux commerce* thesis is in seeming ignorance of this family of meaning (1997, 60).

11. Thus, when Heraclitus sang Walras' Law—“All things are an equal exchange for fire and fire for all things, as goods are for gold and gold for goods”—he used the word *ἀνταμοιβή* (Kirk and Raven 1981, 199). Liddell-Scott-Jones define this as “exchange one thing with another.” There are secondary meanings of *punish*.

The violator of the more sacred laws of justice can never reflect on the sentiments which mankind must entertain with regard to him, without feeling all the agonies of shame, and horror, and consternation. When his passion is gratified, and he begins coolly to reflect on his past conduct, he can enter into none of the motives which influenced it. They appear now as detestable to him as they did always to other people. (84)

Here Smith breaks apart one agent into intertemporal slices; the past actor is judged by the present spectator, who has inherited his or her skin. But since the present actor knows that his or her choice will be judged by a future spectator, he or she will take the future approbation/disapprobation that follows from the choice into account.

Approbation and disapprobation from the spectator are acquired in many ways. Here is Smith's discussion of approbation from material income itself:

It is because mankind are disposed to sympathize more entirely with our joy than with our sorrow, that we make parade of our riches, and conceal our poverty. . . . Nay, it is chiefly from this regard to the sentiments of mankind, that we pursue riches and avoid poverty. For to what purpose is all the toil and bustle of the world? what is the end of avarice and ambition, of the pursuit of wealth, of power, and preheminance? Is it to supply the necessities of nature? The wages of the meanest labourer can supply them. . . . It is the vanity, not the ease, or the pleasure which interests us. But vanity is always founded upon the belief of our being the object of attention and approbation. (50)

Increasing wealth increases approbation by moving an individual up social ranks. Smith compares the approbation due the humble with that of the rich:

The man of rank and distinction, on the contrary, is observed by all the world. Every body is eager to look at him, and to conceive, at least by sympathy, that joy and exultation with which his circumstances naturally inspire him. His actions are the objects of the public care. Scarce a word, scarce a gesture, can fall from him that is altogether neglected. (51)

Modeling the link between income and approbation in terms of a discrete change in social ranks has important technical ramifications.<sup>12</sup>

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12. One small financial loss, such as a losing lottery ticket, will not change one's social rank, but many such losses will. Thus, we ought to be prepared to do without the assumption of transitivity. The power of Smith's insight can be appreciated by seeing how easy it is to develop a katalactic model of gambling for occupation that blocks the Friedman-Savage, St. Petersburg, and Allais paradoxes (Levy 1999a).

### Katallactic Rationality and Competitive Equilibrium

The katallactic moment—katallactics before Edgeworth—could not have had ready and easy access to such devices as utility functions or preference orderings. Indeed, a katallactic model can make no substantial appeal to knowledge of subjective states.<sup>13</sup> We must make do with what we can observe about individuals, choosing physical amounts of income and approbation.<sup>14</sup> Because there is reason to believe that approbation is relative to a language community, we have to be very careful when generalizing across language communities.<sup>15</sup> However, we have learned from Smith two universal claims: first, that approbation flows from acts requiring reciprocity, and, second, that approbation flows from changes in income large enough to change one's rank in society.

We require a modest collection of logical symbols:  $\neg$  (not),  $\rightarrow$  (if . . . then . . .),  $\vee$  (inclusive or),  $\wedge$  (and). We shall have need of an exclusive *or*, but this will be made from the standard components. The choices we consider are observed in a society,  $j$ , which we denote as  $S_j$ . The elements of social world  $S_j$  are described in terms of a pair of material income and approbation. We might have need of the particular social context if the approbation is not universal but rather localized to this particular society.<sup>16</sup> These 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 brackets as statement separators, we employ the convention that the relation  $>$  binds more tightly than the logical operators  $\vee$  and  $\wedge$ .

13. One of the technical differences between Edgeworth's focus on mean utility and what I reconstruct as Smith's focus on the happiness of the median individual is that the mean requires complete knowledge of subjective states, a claim Smith renounced, (see chapter 9).

14. It is therefore a great historical irony that those subjectivists who have kept the notion of katallactics alive in modern economics—von Mises, Hayek, Buchanan, and Wiseman—have not recognized the potential for conflict.

15. Smith claims that in any great society there are two moral systems: a liberal one and an austere one (Feigenbaum and Levy 1992, 74–91).

16. We could think about approbation carried by language as something that can flow theoremlike from the language community that makes up a society. In this case, notation of the form  $S = A(a)$  would be sensible in making the claim that all societies—so there is no subscript on  $S$ —make the same judgment of an act  $a$ . Smith's position that judgments of "right" and "wrong" share structure with "true" and "false" is defended in Levy 1992. One could then look at Kant's enterprise as defending the position that there are norms of the following form:  $= A(a)$ . These would be judgments made by all rational beings.

A valuable piece of neoclassical notation,  $aPb$ , sometimes read as a hypothetical assertion that if a decision maker were given a choice between  $a$  and  $b$ ,  $a$  would be chosen. Following distinguished exemplars, I propose to keep the symbol and change the meaning:  $aPb$  is to be emptied of subjective content.<sup>17</sup> It only means 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; consequently, what imputation is it reasonable to make? The necessary condition of katallactic rationality (KR) we require is that one does not turn down a bundle with both more expected material income and more expected approbation. Thus:

$$aPb \rightarrow [\text{Ex}(a) > \text{Ex}(b) \vee \text{EA}(a) > \text{EA}(b)].$$

The left-hand side of  $\rightarrow$  is an observed choice; the right-hand side is something that we can go out and measure.<sup>18</sup> KR only requires that if  $a$  is chosen over  $b$  there cannot be more of both material income and approbation at  $b$  than at  $a$ .

How does this relate to neoclassical assumptions? The relation is very straightforward: a choice is KR if it does not violate the revealed preference axiom that more is preferred to less. A bundle is KR if there isn't any other bundle that dominates it in the space of *both* material income and approbation. The assumption of transitivity would create a trap of our own making because it can be proven false once we take into account that approbation comes from spectators with an ability to make distinctions somewhat less precise than the greater than relation over the real numbers.<sup>19</sup>

Needless to say, many interesting problems will involve cases in which both  $a$  and  $b$  satisfy KR. Because we condition the states of affairs to a social world,  $S$ , we have the possibility of comparing the relative frequency of a type of action across societies. These societies could be separated by time or space. Let  $a_i, b_i$  be states of affair in  $S_i$  that correspond to  $a_j, b_j$  in  $S_j$ . Examples might be the occupation of a ballet dancer in two states of society or the policy of

17. "And in thus preserving the form while modifying the interpretation I am following the great school of mathematical logicians who, in virtue, of a series of startling definitions, have saved mathematics from the skeptics, and provided a rigid demonstration of its propositions" (Ramsey 1990, 219). The prince of the skeptics was Berkeley (see chapter 12).

18. Approbation is in some contexts straightforward to measure. One of the building blocks of the metrics of science is the citation index. One problem with use of the indices to discuss approbation is that they only count the absolute value, leaving it to the researcher to figure out how to distinguish positive from negative approbation (Feigenbaum and Levy 1997). An approach based on Erdős's coauthorship graphs might avoid this problem: one does not coauthor with people one thinks foolish (Schechter 1998).

19. This is the consequence of Berkeley's strictly finite theory of vision. The failure of transitivity results from the general inability of the modeler to make substitutions of what the model builder knows are identical statements across the beliefs of the actor (Levy 1999a).

honest dealing in two states of society. Then to describe the claim that  $a_i$  is more frequently observed than  $a_j$ , we employed the notation  $f(a_i) > f(a_j)$ .

Because we have no insight into subjective states—an issue that we shall confront in due course is that we have no insight into the time preference of the members of society—we shall assume that the distribution of subjective states is the same across societies. This will allow us to make the second defining characteristic of KR: that incentives matter across societies. If the disapprobation of ballet dancing falls and pecuniary wages do not, we shall observe more dancing. If the rewards of honest dealing differ across societies, we shall observe more honest dealing when it pays the most. This will be expressed in partial equilibrium terms:

$$[\text{Ex}(a_i) \geq \text{Ex}(a_j) \wedge \text{EA}(a_i) \geq \text{EA}(a_j)] \rightarrow f(a_i) \geq f(a_j).$$

And we suppose that if one of the weak inequalities to the left of the arrow is replaced with a strong inequality the inequality right of the arrow changes to strong, too.

This principle that social characteristics, that is, the relative frequency of observed behavior, can be explained by the incentives facing the individuals comprising the group created an intellectual war that continues to this day. The consequence of this katallactic doctrine is that neither race nor national characteristics matter; only incentives matter. Many intellectuals, then and now, found this a “dismal” doctrine.

These two principles comprise KR as I understand it. Perhaps the most celebrated development of KR occurs in book 1, chapter 10, of the *Wealth of Nations*, the explanation of the process by which the net advantages of employment are brought into equilibrium. The nonpecuniary aspects of employment, honor and shame in particular, are explained as compensating for the pecuniary aspects.<sup>20</sup> We can give this principle a name—katallactic competitive equilibrium (KCE). In such a state of equilibrium, one will not find alternatives for which one option gives more of both income and approbation. The competitive process will not allow such options to persist. Thus, it is necessary in KCE that for any move you make you cannot have both more expected income and more expected approbation:

$$aPb \rightarrow [\text{Ex}(a) > \text{Ex}(b) \vee \text{EA}(a) > \text{EA}(b)] \wedge \neg [\text{Ex}(a) > \text{Ex}(b) \wedge \text{EA}(a) > \text{EA}(b)].$$

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20. “Honour makes a great part of the reward of all honourable professions. In point of pecuniary gain, all things considered, they are generally under-recompensed, as I shall endeavour to show by and by. Disgrace has the contrary effect. The trade of a butcher is a brutal and an odious business; but it is in most places more profitable than the greater part of common trades. The most detestable of all employments, that of public executioner, is, in proportion to the quantity of work done, better paid than any common trade whatever” (*WN*, 117).



Absent competition, it may be easy to find choices involving more of both good things; state policy or social institutions keep away competitors or restrict one to a particular occupation.<sup>21</sup>

In one of Smith's exquisite analytical set pieces, he asks what would happen to the wages of ballet dancers if public performance lost its stigma. Our solution would be that the increase in approbation, holding constant material income, would draw people into the profession. This influx would reduce material income. Here is Smith's solution:

There are some very agreeable and beautiful talents of which the possession commands a certain sort of admiration; but of which the exercise for the sake of gain is considered, whether from reason or prejudice, as a sort of publick prostitution. The pecuniary recompense, therefore, of those who exercise them in this manner must be sufficient, not only to pay for the time, labour, and expense of acquiring the talents, but for the discredit which attends the employment of them as the means of subsistence. The exorbitant rewards of players, opera-singers, opera-dancers, & c., are founded upon those two principles; the rarity and beauty of the talents, and the discredit of employing them in this manner. It seems absurd at first sight that we should despise their persons, and yet reward their talents with the most profuse liberality. While we do the one, however, we must of necessity do the other. Should the publick opinion or prejudice ever alter with regard to such occupations, their pecuniary recompense would quickly diminish. More people would apply to them, and the competition would quickly reduce the price of their labour. (*Wealth of Nations*, 124)

The reception in the nineteenth-century economics community of this argument has been described.

### Why Language Matters

Smith claims that a reciprocity norm is central to the social order. The traditional prisoner's dilemma logic makes it easy to make operational 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

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21. Smith recognizes such possibilities: "The police must be as violent as that of Indostan or ancient Egypt (where every man was bound by a principle of religion to follow the occupation of his father, and was supposed to commit the most horrid sacrilege if he changed it for another), which can in any particular employment, and for several generations together, sink either the wages of labour or the profits of stock below their natural rate" (*WN*, 80).

$A_0$  be the approbation from nonreciprocal strategies and require that  $A_1 \geq A_0$ . The condition that  $A_1 = A_0$ —which we allow—corresponds to the case in which approbation is not part of the game. The condition of  $A_1 > A_0$  corresponds to the case in which approbation is earned by, and only by, the relation between one's play and that of the other players.

In our first analysis, we shall explicitly assume that the game is played with sufficiently small stakes that no change in material income changes one's social rank. As Smith was quoted earlier, if social rank changes then the approbation one receives will change. Within a small movement of income, the social rank does not change, and so we can restrict changes in approbation to only changes in the play. After we obtain conditions of katalactic rationality, we can then consider the consequences of a change in income large enough to change the player's approbation.

As is commonplace, we consider two individuals with each of two strategies: Trade or Grab. We depart from the convention by adding the approbation from the spectator's judgment produced by a reciprocity norm.

Matrix 1 contains the familiar prisoner's dilemma, in which 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 Trade, then both will receive three units of income and  $A_1$  of approbation. If both players Grab, then, although their incomes fall to two units 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 Grabs might be judged a ruffian, the one who continues to Trade is judged a sucker.

MATRIX 1. Prisoner's dilemma: material income and approbation		
	Column Trade	Column Grab
Row Trade	$(3, A_1), (3, A_1)$	$(1, A_0), (4, A_0)$
Row Grab	$(4, A_0), (1, A_0)$	$(2, A_1), (2, A_1)$

This argument supposes that the income gain from moving from (in our notation) three to four units is not large enough to move one up the social ranks. If this rank increase were to happen, then the approbation from the gain in income might well cover the loss in approbation from the violation of the reciprocity norm. It is a grim proverb of statecraft that treason never prospers because when it does "none dare call it treason."

Is KR satisfied by the two strategies? The game being symmetric, we need only consider one player. Let us assume that the player believes that the probability of his partner Trading is  $p$  and that he is well enough informed to

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

$$\text{Ex(Trade)} = p \cdot 3 + (1 - p) \cdot 1; \text{EA(Trade)} = p \cdot A_1 + (1 - p) \cdot A_0.$$

$$\text{Ex(Grab)} = p \cdot 4 + (1 - p) \cdot 2; \text{EA(Grab)} = p \cdot A_0 + (1 - p) \cdot A_1.$$

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  $p$ ,  $0 \leq p \leq 1$ , only Grab satisfies KR. Grab always has more expected income and never has any less approbation than Trade, so it satisfies KR. And, importantly, Trade does not. Thus, dogs who cannot provide approbation in their dealings with strange dogs cannot trade. Nor, by this argument, will people who find themselves in a prisoner’s dilemma situation in which they cannot exchange approbation. Of course, in an experimental context it might take subjects some time to realize that this is how the game works.

This result is entirely unsurprising. Once we eliminate the possibility that approbation has anything to do with reciprocity, we collapse the game to the neoclassical commonplace, and from the collapse we obtain the canonical result.

*Case 2.  $A_1 > A_0$ .* For any  $p$ ,  $0 \leq p \leq 1$ , Grab satisfies KR since Grab always has more expected income than Trade. What about Trade? Consider the case of  $p = 1$ , in which one actor is sure that the other will Trade. In this situation, Trade is also KR: Trade obtains more expected approbation than Grab because by assumption  $A_1 > A_0$ . To expand the range of KR for all nonzero  $p$ , all that needs to be done is to increase  $A_1 / A_0$  appropriately. Of course, at  $p = 0$  Grab will remain uniquely KR.

We saw that when Smith himself solved for KCE his model had the result that it is always possible to get more material income by giving up approbation. Many a lady who could have earned additional pecuniary income by means of public performance lived frugally so as not to be thought of as a whore.

What happens when a Grab moves one up sufficient social ranks to obtain enough approbation to offset the loss of approbation from violating reciprocity? Then we have returned to an augmented version of case 1 since we have  $A_1 \leq A_0$ . This is what Smith writes in that wonderfully important but much neglected part of the *Theory of Moral Sentiments* that was added after *Wealth of Nations*.

In the middling and inferior stations of life, the road to virtue and that to fortune, to such fortune, at least, as men in such stations can reasonably expect to acquire, are, happily in most cases, very nearly the same. . . . Men

in the inferior and middling stations of life, besides, can never be great enough to be above the law. . . . The good old proverb, therefore, that honesty is the best policy, holds, in such situations, almost always perfectly true. In such situations, therefore, we may generally expect a considerable degree of virtue; and, fortunately, for the good morals of society, these are the situations of by far the greater part of mankind.

In the superior stations of life the case is unhappily not always the same. (*Theory of Moral Sentiments*, 63)

Smith here and elsewhere shows his distrust of the social extremes.

### Iterating with Tit-for-Tat

Approbation comes partly from action in accord with a theory of conduct, here the theory of reciprocity carried by the economic ideas of ordinary people. In the game theory literature, the reciprocity norm has a name as a strategy, Tit-for-Tat, and it has been studied extensively by Robert Axelrod (1984) and many others. Let us consider the sequences that are generated when the Other always plays Tit-for-Tat (matrix 2). You can Grab or play Tit-for-Tat:

MATRIX 2. The other plays Tit-for-Tat					
	Iteration 1	Iteration 2	Iteration 3	. . .	Iteration $T$
Grab	$(4, A_0)$	$(2, A_1)$	$(2, A_1)$	$(2, A_1)$	$(2, A_1)$
Tit-for-Tat	$(3, A_1)$	$(3, A_1)$	$(3, A_1)$	$(3, A_1)$	$(3, A_1)$

The conclusion that Tit-for-Tat is KR is immediate: there is more approbation in the sequence than Grab. Is Grab KR? This depends upon whether the time-discounted sequence of the additional income in iterations 2 . . .  $T$  suffices to compensate for the initial loss from not picking Grab. Indeed, this is the very problem Smith worried about: is the Grab that allows an individual to attain a sufficiently high income, which we mark as 4, sufficient to pay for the lifetime of lower income? Since KR makes no claims about subjective states—most emphatically not about time discounting—we cannot rule out Grab satisfying KR.

Nonetheless, if we compare societies in which the number of iterations increases from 1 to  $T$ , we observe that income increases for a Tit-for-Tat strategy and, since approbation does not fall, we can make a prediction about the relative frequency of observation. This is the step at which it is vital to assume that the distribution of subjective states of time preference is constant across societies. Here is Smith's memorable claim made to his students:

Whenever commerce is introduced into a country, probity and punctuality always accompany it. These virtues in a rude and barbarous country are almost unknown. Of all the nations in Europe, the Dutch, the most commercial, are the most faithful to their word. The English are more so than the Scotch, but much inferior to the Dutch, and in the remote parts of this country they [are] far less so than in the commercial parts of it. This is not all to be imputed to national character, as some pretend. (*Lectures on Jurisprudence* 538)

It could hardly be coincidence that Hume’s notorious remark “I am apt to suspect the negroes to be naturally inferior to the whites” occurs in his essay “Of National Characters” (1987, 208). KR is all there is; race is nothing. But this a story in itself, one not unrelated to the death of katallactics.

### An Issue of Robustness

You do not know whether the Other will play, but you know that he or she will either always Grab or always play Tit-for-Tat. You do not know how many iterations the game will take; it could be from 1 to  $T$ . What do you do? Grab is the strategy naturally suggested by the Robinson Crusoe model of independent individuals. Tit-for-Tat is the strategy recommended by KR for those disposed to value approbation. Matrix 3 expresses the problem in terms of an optimal decision—it is best to Grab if the Other Grabs—but for players with sufficiently low time discounting it is best to play Tit-for-Tat if the Other plays Tit-for-Tat. What if you get it wrong? If you play Tit-for-Tat and the Other Grabs, you take a one-period loss before you catch on. However, as your time discounting falls and the iterations increase, there is no bound to your loss if you Grab but the Other plays Tit-for-Tat.

MATRIX 3. Grab or Tit-for-Tat		
	Other Plays Grab	Other Plays Tit-for-Tat
You Play Grab	Optimal	Unbounded loss
You Play Tit-for-Tat	Small loss	Optimal

We have transformed the choice between a Robinson Crusoe recommendation of Grab and a KR recommendation of Tit-for-Tat to a problem in robust statistical analysis. Matrix 3 is the canonical form of the robust statistical “insurance” problem. Are we willing to “pay” some small loss in efficiency at one idealized point in space to protect against large losses elsewhere? This insurance paradigm was employed first by F. J. Anscombe (1960) to explain

why normality is such a dangerous assumption in some statistical contexts. The classical estimators are ideal at normality but can generate enormous losses at a distribution other than this ideal.<sup>22</sup>

Unfortunately, the topic of robust statistical analysis seems to fall in that part of the econometrics text that time does not allow the teacher to cover and then only in such sharp contexts as when one *knows* that the error distribution is not normal.<sup>23</sup> The sample mean and least squares are the paradigm of estimators that are ideal in a narrow range of circumstances; the sample median and least absolute deviations are estimators that are far superior in a wide range of circumstances.

Least absolute deviations and Tit-for-Tat share the property of inefficiency at normality and independent agent rationality respectively. The assumption of normality in a regression context is in general equivalent to the supposition that everything of real importance is included in the hypothesized model; all that is left out is an infinite number of random variables of infinitesimal importance (Levy 1999–2000). Neoclassical rationality obtains its claim to efficiency by omitting consideration of approbation since it is the regularity of approbation that suggests Tit-for-Tat.

Neoclassical rationality and modern econometrics focus on considerations of efficiency at some idealized point. The fact that they break down badly at situations other than that idealized point suggest their fragility. If a theory of conduct is required to explain how a society hangs together, it would be odd for something so fragile to have evolutionary success. Would not robustness be of paramount importance?

## Conclusion

Smith's account gives us reason to believe that circumstances in which the supply of approbation is blocked will feature less Trade and more Grab. When approbation is supplied simultaneously with income, we would expect more Tit-for-Tat. By changing their experiments to allow or disallow talk, the experimentalists offer a test bed for Smith's account. One does not get rich, as George Stigler said on occasion, by betting against Smith. There is a robustness in his enterprise that has yet to be fully appreciated.

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22. Tukey 1960; Andrews et al. 1972; Mosteller and Tukey 1977; Koenker and Bassett 1978.

23. Some texts do not do even this. Thus, it is completely instructive that when Greene attempts to demonstrate why it would be silly to use medians instead of means, his Monte Carlo experiment "apparently" demonstrates just the opposite except, of course, when the error distribution is fairly close to normal (1997, 182–83). Perhaps, the results in Andrews et al. 1972 have not been absorbed.

### Appendix: An Interpretative Challenge

Let me call attention to the fact that the entire textual basis of my enterprise was called into question twenty years ago by Albert Hirschman, who in his enormously influential *Passions and Interests* claimed that in Smith's account there is really only one good thing because higher material income and higher approbation are always found together.<sup>24</sup> If the present model has a textual link to Smith and his followers, income and approbation must be able to move independently. Indeed, there must be positions of negative correlation between income and approbation. Indeed, if Hirschman is correct then there will never be a position of katallactic competitive equilibrium, as defined earlier, because states of higher income correspond to states of higher approbation.<sup>25</sup>

An interpretation that turns Smith's katallactic model into a forerunner of Robinson Crusoe models—if material income and approbation are available in roughly fixed proportions, why worry about approbation?—has the entirely useful property of economizing on hard thinking about interrelations among income and approbation.<sup>26</sup> This view of Smith has become rather popular with noneconomists, who in other contexts express a sometimes justified disdain for the economists' propensity to read the analytical limitations of neoclassical economics back into Smith's economics.<sup>27</sup>

To appreciate the importance Smith attaches to the claim that there is a negative correlation between pecuniary income and approbation, note how chapter 10 of book 1 of *Wealth of Nations* begins. Here Smith explains how honor—a nonpecuniary aspect of employment—can compensate for the pecuniary aspects:

The whole of the advantages and disadvantages of the different employments of labour and stock must, in the same neighbourhood, be either per-

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24. "In the passage of *The Theory of Moral Sentiments* that was cited above, Adam Smith then takes the final reductionist step of turning two into one: the drive for economic advantage is no longer autonomous but becomes a mere vehicle for the desire for consideration. By the same token, however, the noneconomic drives, powerful as they are, are all made to feed into the economic ones and do nothing but reinforce them, being thus deprived of their erstwhile independent existence" (Hirschman 1997, 109).

25. "By holding that ambition, the lust for power, and the desire for respect can all be satisfied by economic improvement, Smith undercut the idea that passion can be pitted against passion, or the interests against the passions" (*ibid.*, 110). While everyone can get more material income, it is not clear how everyone gets more approbation. In the future—as Andy Warhol famously said—everyone will be famous for fifteen minutes?

26. The question of the role that the desire for fame plays in scientific discovery is of course a variation on how approbation and material income are linked (Levy 1988a; Coleman 1997).

27. For bald declarations that Smith claims that the motivation by honor or glory is unimportant, see Minowitz 1993, 2, 66–67, 183; and Berry 1994, 154.

fectly equal or continually tending to equality. . . . This at least would be the case in a society where things were left to follow their natural course, where there was perfect liberty, and where every man was perfectly free both to chuse what occupation he thought proper, and to change it as often as he through proper. Every man's interest would prompt him to seek the advantageous, and to shun the disadvantageous employment.

Pecuniary wages and profits, indeed, are every-where in Europe extremely different according to the different employments of labour and stock. But this difference arises partly from certain circumstances in the employments themselves, which, either in really, or at least in the imaginations of men, make up for a small pecuniary gain in some, and counter-balance a great one in others; and partly from the policy of Europe, which nowhere leaves things at perfectly liberty. (116)

I consider gambling for income and approbation elsewhere (Levy 1999a).