

The Nature of Exploitation*

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Abstract

This paper argues that (1) in modern economics the notion of exploitation is ambiguous and has limited utility, (2) certain types of interactions among individual organisms of different species in the natural world can be related to a concept of exploitation, but in this context the concept is devoid of clear ethical connotation, and (3) the ethical and rhetorical value of the concept of exploitation derives from its evolutionary origin in an emotional nexus associated with (a) evolved mechanisms of cheater-detection in cooperative interactions based on contingent reciprocity (tit-for-tat strategy), including the detection of “cheating” in species with facultative paternal investment such as humans, and (b) the formation of coalitions of low-ranking individuals aimed at overthrowing the high-ranking members in the dominance hierarchy.

1 Semantics

From *American Heritage Dictionary*:

ex · ploi · ta · tion 1. The act of employing to the greatest possible advantage: *exploitation of copper deposits*. 2. Utilization of another person or group for selfish purposes: *exploitation of unwary consumers*. 3. An advertising or a publicity program.

From *Encyclopedia of Marxism*:

Marx defined the “rate of exploitation”, also referred to as the rate of surplus value, as the proportion of unpaid, surplus labour a worker performs for their employer to the necessary labour workers perform, producing the value equivalent of the wage they are paid.

... Marx showed how the accumulation of wealth rested on the lengthening of the working day beyond what a worker needs to work to produce their own needs [thereby demonstrating] that this constituted a form of *exploitation*, that is to say, that the profit a capitalist makes for themselves by means of wage labour is acquired *unjustly*.

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Marx intended the concept of exploitation to be an ethically neutral concept used in his scientific analysis of capitalism in *Capital*. Nevertheless Marx and followers make abundant use of exploitation in its ethical meaning, to criticize bourgeois institutions.

In this paper, I argue that (1) in modern economics the notion of exploitation is ambiguous and has limited utility, (2) certain types of interactions among individual organisms of different species in the natural world can be related to a concept of exploitation, but in this context the concept is devoid of clear ethical connotation, and (3) the ethical and rhetorical value of the concept of exploitation derives from its evolutionary origin in an emotional nexus associated with (a) evolved mechanisms of cheater-detection in cooperative interactions based on contingent reciprocity (tit-for-tat strategy), including the detection of “cheating” in species with facultative paternal investment such as humans, and (b) the formation of coalitions of low-ranking individuals aimed at overthrowing the high-ranking members in the dominance hierarchy.

2 Exploitation in Economics

Exploitation in the sense utilized by Marx is not used in mainstream economic theory, as it is closely associated with the deprecated labor theory of value.

Modern uses of “xploitation” in economics are associated with deviation from Pareto optimal equilibrium due some kind of market failure, including:

1. Monopoly – one seller, many buyers; the unique seller has *market power* (i.e., can manipulate price / quantity for excess profit over that possible in a perfect market)
2. Monopsony – many sellers (e.g., of labor), one buyer (e.g., company town); the unique buyer has market power
3. Principal agent problem – exploitation of employer by employee through shirking or embezzling (due to asymmetric information)
4. Free-rider problem – individual benefits from public good without participating in the cost of producing the good

Sense (3), in which the employer is “exploited” by the employee, is not an habitual connotation of the term.

Sense (4), free-riding, has close connection with other meanings of exploitation in the natural world. However free-riding can produce *exploitation of the great by the small* (Olson 1971), also an unusual connotation of the term.

A basic problem of the exploitation concept in modern economics is that it seems to imply direct comparison of utilities of different individuals, which is an implausible assumption.

3 Exploitation in Nature – Cross-Species Interactions

It is instructive to look at different kinds of interactions in the natural world that are related to the concept of exploitation. If human species and human society are continuous with the rest of nature, one would look for related phenomena.

Table 1: Types of Ecological Interactions

Effect on X	Effect on Y	Type of interaction	Example
o	o	Neutralism	(Interaction insignificant or negligible)
-	o	Amensalism	Bacteria, bread mold (<i>Penicillium</i>)
+	o	Commensalism	Remoras (eat leftovers), sharks
-	-	Competition	Cheetahs, lions
+	+	Mutualism or Symbiosis	Cleaner fish, host
+	-	Predation or Parasitism	Lion, wildebeest

In looking at natural world in general there is a criterion that is potentially more measurable and comparable across individuals than utility, which is *reproductive fitness*. (Sometimes measured as an ingredient of fitness, such as resources, nesting sites, mating opportunities).

Interactions across species can be categorized according to the effect the interaction has on the two species involved in the interaction. The next table shows the six possible types of interactions (modified from Wikipedia at *Biological Interactions*).

Formally the entries of the table refer to the sign of the corresponding parameter in the Lotka-Volterra equations of the growth of interacting populations.

Table 1 lists types of ecological relationships between different species by the effect they have on each protagonist. ‘o’ is no effect, ‘-’ is detrimental, and ‘+’ is beneficial.

Note the effects refer to reproductive fitness, which is not necessarily the same as resources.

Where does exploitation takes place?

- Commensalism is perhaps “benign” exploitation (victim does not suffer)
- Competition is antagonistic, but not exploitative
- Predation / Parasitism is most clearly exploitation
- But Mutualism / Symbiosis can conceal exploitation if benefits to X and to Y are unequal
 - Domesticated animals or plants and domesticators (humans or ants) are formally mutualistic, despite clear *domination* of one by the other
 - In nature it is hard to compare benefits to X (say the cleaning fish) and to Y (the host), even though reproductive fitness is a common metric. Is the cleaning fish exploiting the host, or vice-versa?
 - Are there evolutionary mechanisms insuring equality of benefits in mutualistic interaction?



Figure 1: Sociobiologist Robert Trivers (left). Puzzle: Who is the other man?

4 Exploitation in Nature – Within-Species Interactions

4.1 Sexual Strategies & Exploitation

Evolutionary explanations of sexual strategies are based *Parental Investment Theory* (Trivers 1972, 1985), refined by Roughgarden (2004).

Parental investment: “any investment by the parent in an individual offspring that increases the offsprings chance of surviving (and hence reproductive success) at the cost of the parent’s ability to invest in other offspring”

Main consequence of theory: Sex investing the most constitutes limiting resource for other sex, so that “whichever is the sex with greater parental investment will be the sex that is courted, that competes less, and that survives better” (Daly and Wilson 1983)

In nature the sex that invests most is most often (but *not always*) the female.

4.1.1 Generic Female Strategies

One can classify female sexual strategies in the natural world as



Figure 2: Isabelle Huppert in Claude Chabrol's *Madame Bovary* (1991) after 1856 novel by Gustave Flaubert

1. *Domestic Bliss Strategy*: In species where male invests parentally, choose male who shows signs of domesticity and controls resources relevant for reproductive success.
2. *He-Man Strategy*: In species where male does not invest parentally, choose a male with "good genes".
3. *Madame Bovary Strategy*: In some situations it may be feasible for a female to have both a "husband" (for parental investment) and a "lover" (for good genes). May have been important in human evolution.

4.1.2 Generic Male Strategies

One can locate species-typical male strategies on a continuum between:

1. *Dad Strategy*: Maximize paternal investment in offspring, at the cost of mating effort. Do, however, seize opportunity for costless insemination.
2. *Cad Strategy*: Maximize chances of inseminating multiple females, at the cost of paternal investment in offspring.

Roughgarden (2004) in *Evolutionary Rainbows* presents a more complex account of reproductive strategies that goes beyond the generic male / female opposition that is useful in explaining homosexuality, transgender, etc.

4.1.3 Sexual Exploitation in the Natural World

One could identify exploitation in several ways:

- With the male role in general, as exploiting the greater parental investment of the female – especially in mammals due to internal gestation and suckling.

- Specifically with “cheating” in the context of the Madame Bovary strategy, where it represents defection in an exchange of paternal investment (provided by the male) against paternity of the offspring (provided by the female).

Qualifications:

1. A given sex is not a species. Evolutionary mechanisms keep the sex ratio (weighted by any difference in the cost of producing an individual of a given sex) equal (Fisher 1918, 1930).
2. Over the generations any gene has an equal chance of finding itself in a male body or a female body. Thus any gene influencing a behavior is selected to have an (conditional) expression that is equally advantageous in the contexts of a male or female strategy.
3. There are cases of “role reversals”, species (e.g. sea horse), where
 - males make greater parental investment and exhibit “feminine” behavior
 - females make a smaller investment and exhibit “masculine” behavior
4. Sexual selection (female choice) can produce considerable inequality in the reproductive success of males.

4.1.4 Sexual Competition & Dominance Hierarchies

Many animal species have dominance hierarchies. There may be a single dominance hierarchy involving both sexes or two separate hierarchies (e.g., chimpanzees). Rank in the hierarchy is typically correlated with:

1. Mating opportunities. A pervasive pattern in nature is one where rank in the male hierarchy is correlated with access to fertile females (e.g., yellow baboon; preindustrial human societies).
2. Resources (other than mating opportunities). Access to resources such as shelter, food, and offspring safety is also correlated with rank in the hierarchy.

Species / populations vary in the degree of *reproductive skew* (= degree of reproductive inequality) due to the dominance hierarchy, as a function of ecological factors that include the relative fitness advantage of cooperative vs. single breeding, dispersal opportunities of subordinates, and degree of relatedness of dominant and subordinates (Vehrencamp 1983a, 1983b).

Reproductive skew may be the closest counterpart in the natural world of social inequality in human societies.

Dominance hierarchies in social species – conspicuously in primates – are the theater of complex politics based on alliances. In the male hierarchy subordinate males form an alliance to overthrow the monopolistic control on access to mating opportunities held by the dominant male. The female hierarchy is also the theater of complex alliance-based politics related to provision of food and offspring safety. Thus “chimpanzee politics” are characterized by a “circulation of elites”. Primates other than humans do not have language, but one may ask whether subordinate

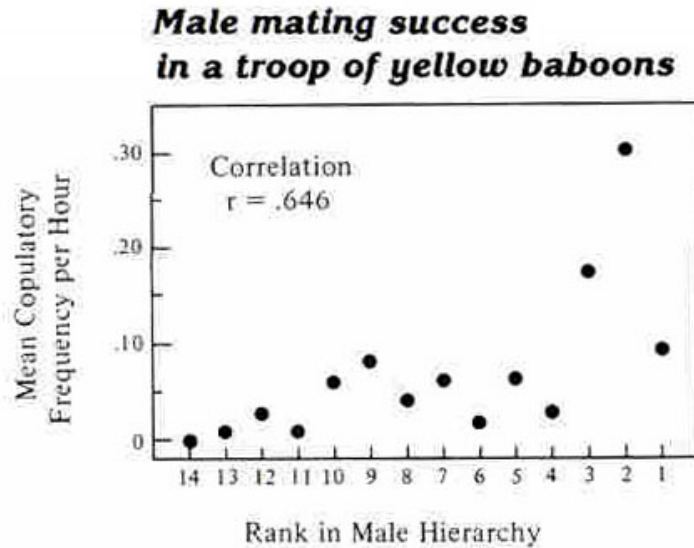


Figure 3: Correlation of male RS (copulatory frequency) with rank in dominance hierarchy in yellow baboons (Daly & Wilson 1983, Figure 5-4 p. 86)

males in a primate dominance hierarchy feel emotions related to a sense of the injustice of their position that might resemble those associated with the concept of exploitation in humans and that may constitute the emotional roots of the concept of exploitation.

4.2 Contingent Reciprocity

The evolution of cooperation through contingent reciprocity may also be at the root of the strong ethical charge and rhetorical power of the concept of exploitation.

It is possible that concept of exploitation has deep roots in the human psyche, as a by product of the evolution in humans of reciprocity based on tit-for-tat sanctioning of cheaters. The central model of the evolution of cooperation was formulated by (again) Trivers (1971, 1985).

Because of the *Prisoner's Dilemma*, cooperation does not evolve spontaneously. The dominant strategy (maximizing individual reproductive fitness) is defection (i.e., non-cooperation). Then how is the evolution of cooperation possible? In species with low rate of dispersal, long life span, recognition of individuals, life in small face-to-face groups with repeated interactions, such as humans during most of their evolution, cooperation can evolve through a simple tit-for-tat strategy: start by cooperating, if the protagonist also cooperates, continue to do so; if the protagonist defects, withhold cooperation.

In repeated prisoner's dilemma, the tit-for-tat strategy is dominant, i.e. will be selected in the course of evolution.

Trivers conjectured that the tit-for-tat strategy is implemented in humans through the evolution of innate moral-emotional propensities to react in adaptive ways to various contingencies related to reciprocity, e.g.:

Prisoners Dilemma (PD)

	D	C
D	2	4
C	1	3

PD Iterated 10 Times

	D	TFT
D	20	22
TFT	19	30

Figure 4: Evolution of Cooperation with the Tit-for-Tat Strategy. In a single Prisoner's Dilemma the dominant row strategy given the column strategy is Defection (D) rather than Cooperation (C). In the Iterated Prisoner's Dilemma the dominant row strategy given the column strategy is Tit-for-Tat (TFT): start by cooperating, and on the following move do the same (C or D) as your protagonist.

- propensity for friendship
- capacity for gratitude and sympathy
- propensity for moralistic aggression against non-cooperation
- capacity for guilt and reparative altruism
- sense of justice

The emotional power of exploitation as a concept may derive part of its power from its close association to innate sense of distributive justice of humans and a specialized capacity to detect cheaters in cooperative interactions.

It may also derive its power from the “climbing maneuver” of male and female primate ancestors within their separate or overlapping hierarchies. “Exploitation” may express the sentiment of subordinate forming an alliance to overthrow the dominant male, as described by de Waal (2000) in his study of *Chimpanzee Politics*. Thus the term may put ourselves in touch through multiple pathways with fundamental aspects of our human social condition.

5 Conclusion & Discussion

The concept of exploitation has limited utility in economics. While the term may be used to describe a situation where the outcome differs from the one that would result from perfect competition, the concept is not theoretically useful (in the sense that it does not lead to additional predictions), and some of the situations described as “exploitative” are at odds with the intuitive meaning of the term (e.g., in the free-rider problem resourceful actors with major incentive to procure the collective good are viewed as exploited by less resourceful, free-riding actors).

The concept of exploitation may be used to describe some forms of ecological interactions in the natural world, but the concept is not necessary. The fitness

outcomes of the interactions can be described without recourse to the exploitation concept.

The exploitation concept nevertheless may have roots in the evolutionary history of the human species (and, without a linguistic manifestation perhaps as a set of specific emotions in social species other than humans). These putative roots are at least of two kinds:

1. The association of the concept of exploitation with evolved mechanisms of cheater-detection in cooperative interactions based on contingent reciprocity. "Exploitation" may be the linguistic signifier of an emotion or set of emotions in reaction to cheating in a relationship of contingent reciprocity. The ability to detect exploitation in an exchange relationship may be an evolved behavioral propensity in the human species that may have been selected because it contributes to protect the individual from cheating, and thus is part of the evolved tit-for-tat based cooperation nexus.
2. Exploitation may also be related to the motivation of low-ranking individuals (males or females) in forming coalitions to overthrow a incumbent high-ranking members in the dominance hierarchy.
3. As a specific instance of (1), exploitation may also be related to "cheating" in a marriage-like relationship in a species, such as humans, in which the male invests significantly in the offspring but is concerned with issues of paternity.

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