Behavioral Marxism I: Collective Action

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Abstract

1 Introduction[1]

Conflict is of course central to Marxian economics. Consistent with Marx and Engels' (1848, 3) belief that "the history of all hitherto existing society is the history of class struggles," most, but not all, of the conflict described involves classes, either "fundamental" or "subsumed" (Resnick and Wolff 1982). Some of it involves individuals, however, on one or both sides, often in different "class positions" but sometimes not. That is, the capitalists and workers who animate Marx's economics can, and do, pursue both individual and collective interests. The individual worker is sometimes in conflict with other workers, sometimes with individual capitalists and sometimes, either alone or with other workers, with capitalists as a class. There is of course nothing wrong with this *per se*. As even staunch critics (Olson 1965), for example) acknowledge, common interests do, from time to time, produce common action: strikes sometimes succeed, and revolutions sometimes occur. If there is an "agency problem" (Matthews 2000a) in Marxian economics, it is a contextual, rather than universal, one.

Furthermore, the co-existence of individual and collective actors, assumed or otherwise, was once not unusual, even outside the Marxian tradition. Rosner (1998) reminds us, for example, that this was also a feature of the "historical school" and, on this basis, identifies Marx as a German, rather than British, economist. There are also antecedents in the British classical tradition, however: Ricardians, for example, tended to rationalize the maintenance, until 1846, of the Corn Laws as an expression of landowners' collective interest. As an historical matter, then, Olson (1965, 102) related claim that the Marxian model

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of the state as the institutionalization of capitalists' collective interests sets it apart from the British classical tradition misses the mark.

The choices that confront Marx's capitalists and workers, either as individuals or as members of a coherent class, are seldom "Walrasian" in the sense that the strategic environment is a datum. Even in competitive labor markets, for example, transactions are sometimes "contestable" (Bowles and Gintis 1993). As a result, a substantial and diverse (Elster 1982 or Coran 1995, for example) number of radical political economists have concluded that both the conflicts and the formations on either side could be represented in game theoretic terms. Even in its current, still primitive, state, for example, the literature on social dilemmas has much to tell us about the conditions under which " class rational behavior" is, and is not, a sensible abstraction.[2]

Indeed, to the extent that the modern Marxist characterization of the state as the mechanism for the collective action of capitalists can (at least sometimes) be rationalized, the force of Elster (1982) criticisms of O'Conner (1973), Foster (1973) and others as "weak functionalism" is somewhat blunted. (The same cannot be said for (Elster 1982) non-Marxist functionalists: Posner (1977) "economic interpretation of the law," for example, is an exercise in "strong functionalism.")

The search for plausible microfoundations for collective action does not require a commitment to *strict* methodological individualism. It will sometimes be the case, as Kirman (1997) observes, that even perfect, but probabilistic, information about individual behavior is not sufficient to predict macrostructure. The observation that some "spontaneous orders" are difficult, or perhaps impossible, to rationalize in these terms does not mean that we should never attempt to do so. Indeed, it is important for radical political economists to (re)claim the term. As Blume (1997) reminds us, "there is no argument that the spontaneous order of the Austrians is necessarily beneficent ... [t]he invisible hand could equally well be Shakespeare's bloody and invisible hand of night as Adam Smith's hand of Pangloss."

If the strategic considerations embedded in most Marxian treatments of individual and class conflict seem to underscore the need for game theoretic microfoundations, an important problem must first be overcome: even in controlled environments, individuals often do not behave as standard game theoretic models would predict. It is for this reason that Muntaner (1994, 118-9) and others have dismissed rational choice Marxism, game theoretic or otherwise, as a "formalistic and deductive [enterprise] ... often contradicted by ... [the] data." From this perspective, the existence of class as a primitive of sorts becomes an alternative to individualist models. Following Burawoy (1989), Muntaner (1994, 118) argues that it is the absence of a "realist theory of knowledge" that undermines rational choice Marxism, in contrast to other behavioral traditions in the social sciences (e.g. social psychology), whose "factual and inductive character" is the result of its commitment to experimentation.

[2] Social dilemma is a broad term for any interaction in which group incentives differ from individual incentives. Examples include collective action, the provision of public goods, and the maintenance of commonly held property.

We reach a different conclusion, however. In particular, we believe that the recent literature in experimental economics (together with previous behavioral work outside economics which economist now take seriously) has moved the discipline (much) closer to Muntaner (1994) ideal, and that observed behavior in the lab is (much) closer to Marx's conception of "economic man" than *homo economicus*. This does not mean, of course, that the individuals involved are not purposeful, as opposed to "hard nosed" (Ledyard 1995) rational, or often self-interested. Furthermore, we believe that it is, or soon will be, possible to rationalize "class rational" behavior in these terms, and that much of this behavior is consistent with evolutionary game theory. We call this research project *behavioral Marxism*.

2 Class Consciousness and Collective Action

Consider Elster's (1982; 1985) canonical example of Marxian functionalism, its rationalization of the observed bias in technological change. As he represents the argument, capitalists as a class benefit from the search for, and introduction of, labor-saving methods of production to the extent that these exert downward pressure on real wages. It does not therefore follow, however, that individual capitalists have an incentive to do so, because no one capitalist can influence the wage rate on his/her own, *and* because each has an incentive to "free ride" on the efforts of others to do so. The bias, he determines, cannot be explained in terms of its benefits to capitalists as a whole, but the conclusion is not definitive: if it exists, "class consciousness [must be] the capacity of a class to behave as a collective actor ... to overcome the free-rider problem" Elster (1982, 466). This is more or less consistent with Mansbridge (forthcoming) definition of an "oppositional consciousness," itself intended to echo Marx's (1852) notion of a class "for itself" (für sich) rather than "in itself" (an sich).

Almost two decades earlier, Olson (1965, 105) had been unequivocal: "the absence of the sort of class action Marx predicted is due in part to the predominance of rational utilitarian behavior, *[f]or class-oriented action will not occur if the individuals that make up a class act rationally."* One reason for the difference is that Olson (1965) frames the collective action problem as a one shot prisoner's dilemma, in which each worker (or capitalist) has a dominant strategy: if other workers "engage" in "class rational" behavior, then those who "abstain" can "free ride," but if others abstain, then abstention is also preferable to unilateral engagement. In contrast, Elster (1982; 1985), citing Sen (1973) interpretation of the Critique of the Gotha Programme, understood that the collective action problem is sometimes better represented as an "assurance game" (Runge (1984) with multiple Nash equilibria. Others have formalized it as a discrete public good game (Diermeier and Van Mieghem 2000) or as a public good game with individual thresholds (Granovetter 1978), all of which also exhibit multiple equilibria.

Even as a one shot prisoner's dilemma, however, the collective action problem is more complicated than first seems. First, as summarized in (Ledyard

1995), there is now a wealth of data on public goods games in which a non-negligible fraction contribute in the first and final round(s) of an experiment, despite "hard nosed" predictions. Second, and more important, "one shot revolutions" sometimes *do* occur. Oliver (1993, 273) concludes that "if he had been a sociologist, Olson might [then] have ... launch[ed] a theory of the nonrational or nonindividualist bases of collective action." At the least, if one defines "rational" in hard-nosed terms, then individualist models of collective action in *simple* games should impose bounds on this "rationality."

With or without such bounds, the dismal logic of the prisoner's dilemma is undermined when the collective action problem is repeated. Friedman (1971) and Taylor (1976) were perhaps the first to rationalize what Hardin (1982) and others observed in practice, that abstention is not a dominant behavior when the discount rate is small enough, or the future matters enough, to support conditional co-operation. Indeed, this "Folk Theorem" has since been extended to cases in which public information about the behavior of others is imperfect ((Fudenberg, Levine et al. 1994)).

It is this framework that also allows the first part of Sabia (1988) defense of the Marxian model of collective action to be formalized, even for *homo economicus*. Drawing on the characterization of the French peasant class in *The Eighteenth Brumaire* (Marx 1852), Sabia (1988, 56) identifies "the existence of multiple, stable and ongoing relationships between ... like-minded workers within ... small groups" as a precondition for the emergence of class consciousness. As he earlier describes this stage of development, "Marx's view is that concentration, homogenization, and enlightenment engenders not only a growing consensus on the part of ever-growing number of workers about their situations and needs but propels also the creation of local worker associations and organizations within proletarian communities" (Sabia 1988, 54). Without the concentration of workers into towns and factories, for example, the "manifold relations" (Marx 1852, 317) that are a prerequisite for conditional cooperation in repeated games cannot exist, and it was for this reason that the French peasants remained a class in, but not for, itself. In a similar vein, the homogenization of workers would eliminate, or at least mitigate, the problem of imperfect information, another obstacle to engagement. Last, stripped of its normative connotations, the enlightenment of workers amounts to a requirement that workers understand the benefits (and costs) of collective action.

It is important to note, however, that the engaged outcome is one in a continuum of sustainable equilibria for the repeated collective action game. In particular, abstention in each period remains an equilibrium. In more formal terms, absent an equilibrium selection mechanism, the mobilization of even small groups of workers (or capitalists) is not inevitable. This is perhaps as it should be. In all but the most mechanistic interpretation of Marx's work, concentration, homogenization and enlightenment are not *sufficient* conditions for the development of class consciousness.

But how does the expression of reciprocal behavior in small(ish) groups, when it exists, evolve into a commitment to much larger classes? Bendor and Mookherjee (1987) find, for example, that even with perfect information about the total contribution to the "collective good," there is, for each discount rate, the number of participants for which conditional co-operation is possible is bounded above. (This result is sensitive, however, to the "production function" for the collective good.) With less information, or with unobservable differences in individual costs of contribution, the problem becomes even more acute.

Sabia's (1988) concludes that the reciprocal but self-interested strategies characteristic of small clusters, first established in the "icy water[s] of egotistical calculation," can sometimes become the conventions or norms that can support collective action in much larger groups. That is, the behavior that was once sufficient to cause *homo economicus* to punish a free rider can become a norm about, for example, injustice, and the basis (Mansbridge 2000) for oppositional consciousness. *Homo economicus* is transformed into *homo reciprocans* (Bowles and Gintis 1998).

It remains to show, however, that these conventions, once established, can survive in a world where individuals will sometimes "mutate" into free riders, or in which these conventions are sometimes put to the test. From time to time, norms must be enforced, and enforcement requires sanctions. Sabia (1988, 57) believes that even as "local associations" expand, or are somehow connected to one another, that effective sanctions are possible "because any potential free rider would be violating a convention that he or she respects at the smaller level *and* because some others in the smaller group(s) of which [he or she] is part will know this." On the other hand, Oliver (1993) and others are suspicious of solutions to the collective action problem that require, or seem to require, the provision of a "second order" collective good. That is, even norm adherents will have an incentive to free ride on its enforcement.

Recent developments in evolutionary game theory suggest this could be a smaller problem than first seems, however. Consider a two stage game in which the first stage is the standard prisoner's dilemma. In the second stage, the first stage choices are revealed and participants are able to punish one another, at some cost to themselves. In this framework, then, a co-operative norm enforcer is someone who engages in collective action in the first stage and sanctions those who abstained. Combined, the two stages constitute the "norms game" first described in Axelrod (1986). Suppose that participants in this norms game are "boundedly rational" in the sense that each is committed, perhaps for the reasons Sabia (1988) describes and we elaborate on in section 4, to one of the eight possible pure strategies, and that, for the moment, participants are re-paired, at random, so that the conditional reciprocation consistent with the various Folk Theorems is ruled out *a priori*. Last, the participants are assumed to be self-interested in a purposeful, rather than hard-nosed rational, sense: each has an "aspiration level" drawn from some uniform pdf, and does not alter her/his behavior if her/his payoff exceeds this aspiration, but switches to another, with the same likelihood as its current share in the population, otherwise. Under these conditions, the so-called "replicator dynamics" (Taylor and Jonker 1978) will describe the evolution of norms.

It is not difficult to see that, under these conditions, a population of norm enforcers will be neutrally stable. So, too, will a population of unconditional defectors, so that the formation of class consciousness is possible, but not inevitable, and will turn on the initial shares – hence the importance of Sabia's (1988) local associations – and the respective "basins of attraction."

Sethi (1996) adds a ninth strain, *homo economicus*, who chooses the hard headed best response to each possible opponent, with surprising results. First, and most important, there are no evolutionarily stable states (ESS), or for that matter neutrally stable states (NSS), in which *homo economicus* survives on her/his own. If the "hard nosed" survive, it is in an ESS in which either "bullies" – those who abstain from collective action and punish those who do not – or "passive defectors" – those whose commitment to the "rational" choice (abstain, and refrain from punishment) is unconditional – coexist with them. Radical political economists will not find it difficult to visualize either scenario. In the first, "enlightened self-interest" characterizes some workers (or capitalists) who would be prepared to contribute to collective action if a sufficient number of others were committed, in a "non-rational" sense, to the cause, but these workers never mobilize because of the presence of "anti-collectivists," who do not contribute and punish those who do. In the second, the same "enlightened" workers or capitalists do not mobilize because there are a substantial number who understand "self interest" in much cruder terms.

Second, there is an ESS in which co-operative norm enforcers alone survive. Furthermore, participants fare better in this environment than either of the other two. That is, there are environments in which "class consciousness" can exist, even thrive, and the process that produces this outcome has plausible, individualist, microfoundations. Whether or not it happens depends, once more, on historical preconditions – initial values - and chance events.

Furthermore, if and when this "class conscious equilibrium" is reached, small perturbations in the strategic environment will lead to behavior consistent with the collective pursuit of common interests. In Matthews (2000b), the same norms game is recontextualized as a variant of the Michl and Baldani (2000) model of technical change as a prisoner's dilemma, to show that even under variations in cost conditions, the choices of class conscious capitalists will sometimes be consistent with their collective interest, in this case the maintenance of the profit rate in the face of Marx's tendential law.

Carpenter and Matthews (2002) extend Sethi's (1996) model to allow for both "in group" and "out group" sanctions, and find that "social reciprocators" can also survive.

There is a second, albeit related, set of models that could allow class conscious behavior to be rationalized. In *indirect evolutionary models*, it is preferences, rather than behavioral rules, than unfold over time. Fitness is still measured in terms of material benefits, but this now determines the rates at which preferences, rather than behaviors, are transmitted. These models seem closer in spirit to Sabia's (1988, 59) characterization of class consciousness, in which "solidarity [should be] understood as a form of consciousness or component of individual character" rather than a selective incentive but, following Binmore, McCarthy et al. (2000), Sethi and Somanathan (2000) conclude that there are methodological difficulties with this approach.

Viewed from this perspective, the question becomes if, and how, a preference for class-based solidarity might survive under a plausible selection mechanism. The answer, once more, seems to be that there are (some) equilibria in which this occurs. In Guttman (2000), for example, participants are able to draw inferences about, and exploit, the preferences of others. Even if preferences cannot be observed, however, assortative interaction is sometimes possible, as in Bowles and Gintis (1999).

3 A (Very) Simple Model

Suppose that there are N workers, each of whom must choose how much of their "endowment" w to contribute to the pursuit of class-related objectives. For each contribution x_i, all receive rx_i, where $r < 1$, so that the material payoff to i is just $\pi_i = w - x_i + r \sum x_i$. If, in addition, $rN < 1$, this collective action game is a prisoner's dilemma, in the manner of Olson (1965). Standard game theoretic methods predict (in the one shot version of the game, at least) that no worker will contribute.

Suppose, however, that there is some, perhaps small, likelihood of a "shock" to workers' preference functions. That is, it is now possible that workers, perhaps as a result of their participation in local associations, have assimilated a reciprocal norm or convention, but that it is also possible the anonymous nature of class membership causes workers to overestimate the benefits of selfish behavior. As Anderson, Goeree et al. (1998) then show, if the structure of these shocks assumes the continuous version of the logit (Chen, Freidman et al. 1995) form, then each worker's prior pdf over actions will be:

$$f(x_i) = \frac{\exp(\pi_i^e(x_i)/\mu)}{\int \exp(\pi_i^e(x_i)/\mu)dx}$$

where μ is proportional to the standard deviation of the "error" distribution.

If each worker is rational in the sense that s/he assumes other workers will experience similar shocks, then the equilibrium is a fixed point of the function that maps distribution of actions into expected utilities and expected utilities into distributions of actions. Anderson et al. (1998) show that in linear public good games like this one, the *quantal response equilibrium* is:

$$f(x) = \frac{\lambda \exp(-\lambda \pi)}{1 - \exp(-\lambda w)}$$

where λ is proportion to $1 - r$. The mean contribution is between 0 and $w/2$, and the equilibrium has four important properties. First, an increase in r, the value of the public good, leads to an increase (in stochastic terms) in contributions. Second, an increase in the size of the preference shocks also leads to an increase in contributions. Third, an increase in the number of workers has no effect on individual contributions, and fourth, an increase in endowments w is associated with an increase in contributions.

All four properties have important implications for the evolution of class consciousness. The first suggests that even self-interested workers whose preferences are vulnerable to small "trembles" as a result of their involvement in local associations will contribute more as the benefits of mobilization increase. The likelihood of "rational revolution" rises, in other words, when the differences between capitalists and workers are wide. In a similar vein, the more successful local associations have been, the larger the standard deviation of the preference shocks, and the more workers will contribute to "broader causes." The third reveals the Olsonian conjecture about the effects of group size to be more fragile than often believed: mean contributions do not fall as the number of workers N rises. And last, workers who can contribute more often will, other things being equal. The first and last hint that the timing of collective action is subject to competing pressures: in the earliest stages of capitalism, when the differences between capitalists and workers are wide, workers also have less (in absolute terms) to contribute.

Under the usual interpretation, μ is a monotonic measure of the likelihood that workers make "errors": as μ tends to zero, no one contributes, and as it tends to infinity, workers' pdf over actions becomes uniform. It is our position, however, that what lies between homo economicus and random choice is not "near rational" behavior but something else, an awareness of the possibilities for collective action (we term this an ingroup bias).

If one substitutes a step function or "provision point" for the production of the public good – that is, for workers to revolt, the number who engage in collective action must exceed some threshold – the results are even more dramatic. Using the same sort of "perturbations" as Anderson, Goeree et al. (1998), Diermeier and Van Mieghem (2000) find that the model predicts rare, sudden bursts of collective action that tend to occur in clusters, consistent, in their view, with the 1989 Leipzig Monday demonstrations that led to the collapse of the GDR.

Furthermore, McBride (2001) solves for the quantal response equilibrium of a model where the threshold is unknown to participants, and finds that under some conditions, wider uncertainty can even be desirable.

Chwe (1999), on the other hand, allows individuals to be hard-noised, but assumes that each has her/his own participation threshold, a formalization of Granovetter (1978), and embeds each within a social network. He finds that when thresholds are low, "strong links," of the sort forged among friends in local associations, facilitate participation, but when thresholds are high, "weak links" are preferable. Furthermore, he concludes that the conventional wisdom that collective action is sensitive to the thresholds of the first, or earliest, individuals to move assumes the absence of reciprocal information.

4 Empirical Support for a Marxian Theory of Collective Action

> *In this struggle, of which we have noted only a few phases, this mass becomes united, and constitutes itself as a class for itself. The interests it defends become class interests.*
> (Marx, 1977, Selected Writings, p.214)

Although a small literature has arisen that can be described as Marxian social psychology (e.g. Leont'ev 1968, Young 1975, and Ulman 1991) that addresses exploitation and inequality in addition to collective action, we follow a different path seeking specific behavioral evidence to justify our claims about the plausibility of a Marxian theory of collective action from all the social sciences. Specifically, in this section we discuss experimental evidence from social psychology, sociology, political science, and economics. Further, our analysis focuses on six factors which Marx asserted either favored or hindered collective and class action. The six factors we concentrate on expand on the list discussed above and are: the existence of an ingroup bias, actors understanding of social dilemmas, group homogeneity, group turnover, the structural components determining the productivity of prosocial acts, and social sanctions.[3]

4.1 Ingroup Bias

Marx asserted the differential propensity of class members to behave prosocially towards each other when common interests where are stake. Workers, for example, feel solidarity with other workers and this causes them to be more likely to cooperate in face of the incentive to free-ride. Sociologists and social psychologists refer to this phenomenon as the existence of an ingroup bias (IGB). In general, an IGB occurs when members of a well-defined group behave differently towards other members of the group than they do towards people outside the group. For our purposes, IGB is important because it manifests itself in social dilemma situations by causing group members to be more cooperative with each other.

The behavioral evidence supporting the existence of an IGB is expansive. The most robust finding is that forming or increasing the salience of an ingroup leads to more within-group cooperation in prisoner's dilemma, public goods, and common pool resource experiments. In her survey of ingroup experiments, Brewer (1979) concludes that becoming a member of a group causes a person to look favorably on other group members and care more for their well-being. Further, she reports that this prosocial effect is a stronger determinant of behavior than the associated process by which group members simultaneously decrease their opinion of outgroup members.[4]

[3] A fuller development of these factors is presented in Elster (1985) and Sabia (1988).

[4] Also see Eckel & Grossman (2001) who generate an IGB in a team production setting and Yamagishi & Kiyonni (20000) who show players in a prisoner's dilemma situation expect more trust and reciprocity from ingroup members.

The existence of an IGB also appears to interact with other variables that Marx saw as determinants of the propensity toward prosocial acts. For example, Brewer & Kramer (1986) show that group size, a causal factor of the productivity of prosocial acts, interacts with the salience of group boundaries in a common pool resource experiment. Counter to the conventional logic, larger groups showed more restraint when group affiliation was stressed. Similarly, Brewer (1979) writes that more homogeneous groups (where homogeneity is measured by ideology as well as other factors) are more likely to demonstrate and act in accordance with an IGB. Finally, Kollock (1998) argues that an IGB can cloud one's understanding of the incentives of a social dilemma situation.[5] In his prisoner's dilemma experiments, members of highly salient ingroups ranked mutual cooperation over defecting on a cooperator despite the greater material gain to defecting. At the same time, as the salience of group membership fell, more players reversed this ranking.

In addition to identifying the existence of an IGB, experiments have also been conducted to identify the microfoundations of the bias.[6] One dimension of the IGB that stands out is conformity. For example, Parks, Sanna et al. (2001) demonstrate that participants in a hypothetical social dilemma tend to conform to the behavior of the other members of their ingroup. Further they show that this behavior arises in both large group public goods games and two-person prisoner's dilemma games. In a different setting, Haslam and Platon (2001) show that, to be effective at organizing collective action, leaders must conform to and reinforce conformity to group ideology. It appears that increased conformism translates into a more salient IGB and more group-related prosocial activity.[7]

Not only does an IGB lead to more prosocial activity within the group, as stressed by Marx in the context of workers and capitalists, an IGB also leads to feelings of aggression and competition towards outgroups. Komorita & Lapworht (1982), Kramer & Brewer (1984), Bornstein et al. (1996), and Carpenter and Cardenas (2001) all show that splitting a group that faces a social dilemma into subgroups causes competition to arise between the subgroups to the detriment on the overall level of cooperation. Similarly, Mackie, Devos et al. (2000) report that the stronger group members feel the group position is (i.e. in this case the more salient the ingroup is),the more likely they are to support action against an outgroup.

[5] Ahn, Ostrom and Walker (1999) find similar results without checking for an IGB.

[6] Note, in this case, by microfoundations we mean behavioral attributes of individuals that lead to ingroup biases. We don't assume these attributes are the result of a decision making process in which cost and benefits are weighed. That is, the current meaning differs from standard usage - providing incentive compatible explanations of macrophenomena.

[7] Prosocial acts within groups are not limited to cooperation in social dilemmas. Carpenter, Burks and Verhoogen (2001) show that workers demonstrate considerably more altruism towards each other than students do towards each other in a Dictator experiment. When given \$100, students give away \$25 on average while workers give away \$45. One can argue that the salience of the workers' group membership is higher because of repeated daily interactions and the relative importance of cooperation in the interactions on top of the mostly social ties students tend to form.

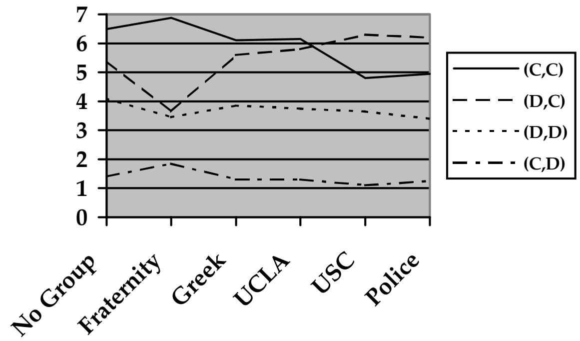

Figure 1: Naturally Occurring IGB (source: Kollock 1998)

As it is representative of this research, we believe it is useful to explain Kollock's experiment in more depth. Participants were told that with some probability they would play a prisoner's dilemma game with someone else after filling out a survey in which they ranked the four outcomes of the game's normal form: (C,C), (D,C), (D,D), and (C,D). To manipulate the degree of IGB, the participants (fraternity members at UCLA) were told they were playing with an anonymous 'other' from one of four groups: fellow fraternity brothers, students from different fraternities and sororities on campus, students from a rival campus (USC), or the UCLA Police Department.

Figure 1 summarizes Kollock's results and provides evidence that naturally occurring group boundaries make group membership salient and trigger an IGB (and and outgroup bias). The main, significant, effect of group membership was in the ranking of the mutual cooperation outcome, (C,C), ($p<0.01$) and exploiting one's partner, (D,C), ($p<0.01$). Partners became averse to exploiting other fraternity members (the highest salient group), but increased their rankings of exploiting adversarial outgroups (e.g. USC students and the police). Likewise, participants increased their ranking of the mutual cooperation outcome only when playing with their fraternity brothers. Given these outcome rankings, Kollock concludes that members of highly salient ingroups look at social dilemmas as assurance games when playing with other ingroup members, but view at the situation, correctly, as a prisoner's dilemma when playing someone from an adversarial group.

In sum, the experimental literature supports the existence of what has been termed an ingroup bias. This bias is important because it provides a foundation for Marx's theory of collective action and is related to the more common term, solidarity or class consciousness. The empirical evidence suggests that conformism and homogeneity are important factors leading to the formation of a salient bias in favor of other group members and against individuals outside the group. This bias takes the form of changes in individual social orientation (Griesinger & Livingston 1973, McClintoch & Liebrand 1988) in which one becomes more altruistic towards others in the group and more competitive towards individuals not in the group. These biased preferences then, under the right circumstances, translate into more cooperation within groups and more aggression towards other groups.

As we will see, the other factors we attribute to Marx can be, to one degree or another, subsumed under the ingroup bias. That is, with further review of the behavioral literature, it will become clear that homogeneity (as we have seen above), understanding the incentives of a social dilemma, turnover, punishment, and structural factors all can be seen both as determining the propensity to cooperate directly and as affecting the formation and prominence of an ingroup. This means that our re-interpretation of a Marxian theory of collective action hypothesizes that one factor is crucially important, the IGB. As in section 3 above, we claim that strengthening a classes IGB translates into the kind of solidaristic preferences necessary for our quantal response model to be plausible and select equilibria in which class action obtains. Additionally, while the focus is on the IGB, we complicate the analysis be noticing that the other five factors matter both to the degree that they make group boundaries salient and through other, more direct, channels.

4.2 Understanding One's Situation as a Social Dilemma

> *They [the working class] ought to understand that, with all the miseries it imposes upon them, the present system simultaneously engenders the material conditions and the social forms necessary for an economic reconstruction of society.*
> (Marx, 1975, Wages and Profits, p.152)

There are (at least) two ways in which workers might misunderstand the incentive to act collectively. First, they may simply lack the cognitive ability to understand their class position (i.e. that there are potential benefits to prosocial acts, but no one has the unilateral incentive to act prosocially) and it may not be clear where to direct class action (e.g. workers may not know that capitalists exploit them). Presumably, this cognitive problem will diminish the likelihood of class action, but can be corrected by education. However, misunderstanding the logic of collective action might also work in favor of the working class because the source of misunderstanding, framing and an IGB, tends to make people more cooperative.

Indeed, one's cognitive capabilities have been shown to affect play in the prisoner's dilemma, but the results are counter-intuitive (at least to economists). Nydegger (1974) and Pincus and Bixenstine (1979) show that people who are better at abstract information-processing are more likely to cooperate in the prisoner's dilemma. In general, these studies show that greater cognitive ability translates into a higher propensity to cooperate. However, this result is curious because one would imagine that higher cognitive ability would make one better at game theory, and if people are basically egoistic, better game theorists are more likely to defect in a finitely repeated or one-shot prisoner's dilemma.

Framing may affect both one's cognitive ability to understand social dilemmas because different frames either hide or accentuate different relationships and one's processing of the incentives of collective action because frames may make group boundaries either more or less salient. Pruitt (1967; 1970) and Pincus and Bixenstine (1977) look at the *decomposed* prisoner's dilemma to understand the effect of framing. Table 1 illustrates an example of a decomposed game.

	Matrix A			Matrix B			Matrix C	
	A	B		Give me	Give him		Give me	Give him
A	12,12	0,18	A	6	6	A	0	12
B	18,0	6,6	B	12	-6	B	6	0

Table 1: The Decomposed Prisoner's Dilemma (source: Pruit 1967)

Matrix A is the standard representation of the game where strategy A is cooperative, but dominated by B. Matrix B is one decomposition of matrix A. Notice, if both players choose A, they both keep 6 and give the other person 6 yielding the (12,12) outcome in matrix A, and if one chooses A and the other B, the B chooser takes 6 from the A chooser and adds it to his or her outcome resulting in the (18,0) or (0,18) outcome. Matrix B is thought to emphasize the control one has over gains while Matrix C is thought to emphasize the importance of mutual cooperation. When played, matrix A, the fully composed game elicits 40% cooperation while the individualist game, matrix B, elicits low levels of cooperation (20%) and the collectivist game, matrix C, generates high levels of cooperation (80%).

One interpretation of the data on the decomposed prisoner's dilemma is that some how matrix B is a better description of the incentives to a layperson because it elicits less cooperation. Alternatively, one could argue that the differences in the frames either make the two players feel more or less like a group and from section 4(a) we know that group members are more likely to act prosocially towards each other. In this case, presenting the game in a way that emphasizes the need for cooperation to achieve a high payoff (matrix C) may make players feel as if they have common cause and are members of a common group while emphasizing the ability to get 12 unilaterally by choosing B (matrix B) may hinder solidaristic feelings among participants.

4.3 Group Homogeneity

> *The ordinary English worker hates the Irish worker as a competitor who lowers his standard of life... The Irishman pays him back... He sees in the English worker at once the accomplice and the stupid tool of the English rule in Ireland. This antagonism is artificially kept alive and intensified by the press, the pulpit, the comic papers, in*

> *short, by all the means at the disposal of the ruling classes. This antagonism is the secret of the impotence of the English working class, despite its organization.*
> (Marx, 1870, to Meyer and Vogt)

Group homogeneity is linked to the ingroup bias for obvious reasons – heterogeneous groups tend to form into subgroups that, as we saw in section 3(a) compete with each other. According to Brewer (1979), in general, the more homogeneous a groups is, the more salient is the IGB and the more group beneficial is the activity that occurs.

To examine the effect of an ingroup bias and outgroup competition, Carpenter & Cardenas (2001) examine how differences in group affiliation may affect the level of cooperation in commons situations. To do so the authors design a real-time, cross-cultural common pool resource (CPR) experiment purposely using participants from cultures that derive different benefits from biodiversity (extraction versus conservation) to analyze the effect of group affiliation on cooperative behavior. In the CPR environment, the authors find evidence that group affiliation affects behavior. Specifically, they show that American students maintain their extraction in the mixed treatment (both Colombian and American participants) compared to homogeneous groups (American only) while Colombian participants extract more in the mixed treatment.

However, the authors also witness an outgroup bias which takes the form of competition and negative reciprocity by exploited subgroups. Here subgroups that extract less in one period (i.e. are exploited) tend to extract more in the future and the magnitude of this adjustment is determined by participant nationality and our treatments. Figure 2 illustrates Carpenter & Cardenas' main exploitation results. Figure 2 plots the size of the regression coefficient on the variable that measures how much a subgroup was exploited last period (i.e. how big the difference was between the subgroup's extraction level and the level of the other subgroup). Further, the data is split between what the authors term *positive reciprocity*, when a subgroup reduces its extraction after the other subgroup does so and *negative reciprocity* which occurs when subgroups react spitefully to greater exploitation (i.e. react to increased other subgroup extraction by extracting more oneself). As one can see, there is not much positive reciprocity between subgroups; in fact, none of the positive reciprocity coefficients is significantly different from zero. However, there is considerable competition and negative reciprocity. And, most interestingly only for Columbians does the level of competition between groups depend on whether the larger group is homogeneous or heterogeneous (compare the negative reciprocity coefficients for Bogota and Bogota Mixed).

However, homogeneity may also play an independent role in determining the amount of cooperation in a group. First, Stallings (1973) reports that group action tends to evolve from homogeneous initial beliefs according to Smelser (1962) *generalized belief* hypothesis in which groups are more likely to organize collective action when they share beliefs. However, he also illustrates how the environmental movement has organized itself despite a significant level of belief

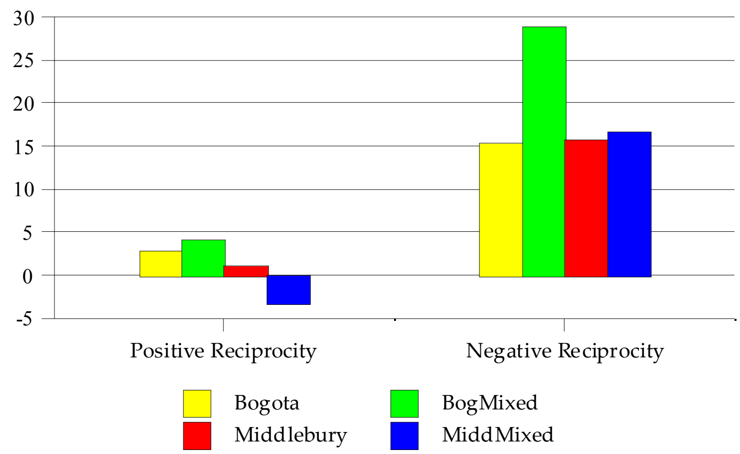

Figure 2: Reactions to Exploitation (source: Carpenter & Cardenas 2001)

heterogeneity due to an endogenous group processes similar to our model of section 3. Second, according to the *triangle hypothesis* (Kelly and Stahelski 1970) competitively predisposed individuals expect others to be homogeneously competitive while cooperative types tend to believe the population is mixed between competitors and cooperators. Returning to figure 1, we see that, across conditions, being the 'sucker' in a social dilemma is ranked as the worst possible outcome. Now, if players make expectations about the cooperativeness of the population they play social dilemma games in, then the initial cooperativeness caused by an IGB will spread because of the expectations of cooperators.

There is evidence supporting the triangle hypothesis. Miller and Holmes (1975) compare the expectations of people playing in two different dilemmas and find that competitors do expect to be playing with a homogeneous population of competitors. Further, van Lange (1992) replicates the general results of Miller & Holmes and also shows that competitors are more sure of their expectations than cooperators are.

4.4 Group Turnover

As with understanding the situation, we can think of at least two ways in which group turnover might affect cooperation. The first is derivative of repeated games. Specifically, given the folk theorem, games with uncertain endpoints and stable group membership allow the equilibria to arise in which cooperation is sustained by reputation or reciprocity and punishment (e.g. playing tit-for-tat or other trigger strategies). However, such cooperative outcomes do not arise when groups are constantly being reshuffled because there is no incentive to form a reputation or punish free riders when you will not likely be in the same group later to recoup the costs of punishment.

To test the relevance of these sorts of folk theorem explanations of cooperation, economists have run a number of public goods experiments in which players either stay in the same group for the entire experiment or are randomly re-shuffled into new groups after each decision-making round. Intuition says that groups of 'partners' (i.e. those who stay in the same group) will cooperate more because they can form reputations and credible punish free riders and groups of 'strangers' (those who are re-shuffled) will cooperate less. Initially, Andreoni (1988) produced exactly the opposite result, strangers cooperated more than partners. However, upon replication, Croson (1996) and Keser & van Winden (2000) find that partners do contribute more to a public good than strangers. Hence, overall it appear that group turnover may matter to the extent that it reduces the incentive to police noncooperation and invest in reputations.

However, another set of economic experiments shows how turnover might actually benefit cooperation. The key, in this case, is that if turnover is non-random and, in particular, leads to assortative interactions (i.e. cooperators are more likely to meet cooperators and defectors are more likely to meet defectors) then cooperation can flourish.[8] In a clever experiment, Ehrhart and Keser (2000) allow group membership to evolve endogenously in a public goods game. Specifically, they allow players to leave groups at some cost and form new groups. Their results show that this manipulation does allow cooperators to leave groups filled with free riders and establish new cooperative colonies, but because cooperators can not act parochially to keep free riders out, free riders soon find cooperative groups and invade them. With more power to control group membership, one might expect that cooperation would flourish in groups established by those who signal their social orientation by leaving uncooperative groups. In a related experiment, Ameden et al. (1998) also allow non-random grouping, but in this case, the assortation is done by the experimenters. The instructions state the people will be sorted, but not how. Placing all the most cooperative players in one group allows the high contributing group to achieve near Pareto optimal outcome levels.

However, we feel that the rationale closest, in spirit, to what Marx had in mind was that it is harder to maintain cooperative norms in groups that are constantly having members leaving and new members (who presumably have not internalized the group's norms) entering. As far as we can tell there is little in the way of experimental evidence on one side or the other of this hypothesis. However, one experiment run by Schopler, Insko et al. (1994) is very close in design to this concept. In this experiment, 3 people form a group and decide collectively on a group strategy in the prisoner's dilemma (they play against another 3 person group). The experiment is repeated and played for four trial blocks of five rounds each. In the first trial block, one of the three group members is a confederate of the experimenters. In one condition the confederate is a strong advocate of cooperation, in a second condition the confederate is passive (i.e. neither advocating nor opposing cooperation). For

[8] This argument also applies from a theoretical perspective if one allows a specific form of the replicator dynamic that allows for assortative interactions. See Skyrms (1996) or Carpenter (1999) for examples.

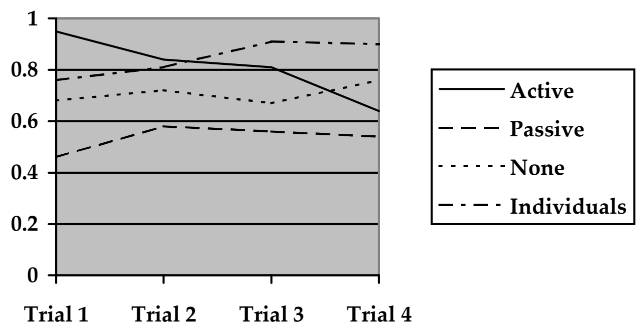

Figure 3: Mean Proportion of Cooperation (source: Schopler et al., 1994)

our purposes, the interesting manipulation is that after the first trial block, the confederate is replaced by another subject and the game is continued. Further after the second trial block another original team member is replaced and after the third block, none of the original members are left.

Figure 3 illustrates the mean level of cooperation in the two treatments compared to the case when there are no confederates (None) and when participants play as individuals instead of groups. The interesting comparison is the trajectories of the active and passive treatments. The initial levels of cooperation are at the extremes of the elicited values with the manipulations working in the hypothesized direction (active confederates achieve more cooperation, but passive confederates dampen cooperative spirit), however by the end of the forth trial block, the levels of cooperation are comparable. The main result is that turnover does weaken an initially strong sense of cooperation fomented by the active confederate. Further, the drop in cooperation (trial 1 mean minus trial 4 mean) is the largest in the active condition indicating that the effects of strong opinions decay faster than group generated opinions. In this sense, Marx did correctly hypothesize how turnover might affect the sustainability of collective action.

4.5 Structural Factors

Ledyard (1995) surveys the effect of structural factors on the provision of a public good. By structural factors we basically mean the factors that determine the productivity of a prosocial act. In public goods experiments, there are two factors, group size and the productivity of the public good which is summarized in the marginal per capita return (MPCR) from the public good. In most public goods games players have two choices for the use of their token endowment. One choice is to keep all their endowment which returns one experimental monetary unit per token kept and the second choice is to contribute part or all of their endowment to the public good which yield the MPCR for each group member regardless of their contribution levels. For the game to simulate the provision of a public good, one sets $\text{MPCR}<1$ and $\text{n}\times\text{MPCR}>1$. Table 2 summarizes the effects of changing the group size between 4 and 10 persons and changing the MPCR from 0.3 to 0.75.

		Average Contribution Level	
		MPCR	
N	4	19%	57%
	10	33%	59%

Table 2: Structural Change iand Public Goods (source: Ledyard 1995)

In general, increasing the MPCR increases contributions despite contributing nothing still being the dominant strategy. While this fact is anomalous theoretically, it makes sense that reducing the benefit to free riding (1-MPCR) should result in less free-riding as Marx would have predicted. Perhaps more anomalously, one can also see that increasing the size of groups also increases contributions contrary to Olson's (1965) hypothesis. However this result is partially contrived because, notice one cannot change the size of the group without implicitly changing the relationship between the incentive of the group and the incentives of the individual. For example, say group size is four and the MPCR is 0.3. In this case, an individual contribution generates $0.3\times4=1.2$ EMUs in benefits for the group, but if we increase the group size to ten the a contribution generates 3 EMUs in benefits. Hence, in this experiment larger groups can take advantage of higher payoffs and specifically, if only 4 of the 10 contribute, individuals gain 1.2 EMUs from the public good which doesn't look so bad compared to the 1 EMU one gets from keeping another token. However, in four person groups, everyone has to contribute before the public good seems like a good investment.

Overall, changes in the incentive to contribute to collective action do seem to matter to individuals. Despite there being a strong, Olsonian prediction that everyone will free-ride, reducing the benefit to free riding does increase contributions.

4.6 Punishment

We are also interested in the role of punishment. Punishment opportunities, often designed by experimenters to be empty threats, have been used regularly by participants to sanction players acting with self interest. In relation to a Marxian theory of collective action and class consciousness, cooperation can be supported if people punish free riders.

The first public goods experiment incorporating mutual monitoring was Fehr and Gaechter (2000)[9] who confirm the reciprocity conjecture generated by An-

[9] However, using the broader category of social dilemma experiments, Ostrom, Walker and Gardner (1992) were the first study to examine mutual monitoring. Their experiment used

dreoni (1988). Andreoni showed that contributions decayed as would be expected by an equilibrium learning hypothesis, but contrary to learning also showed that when the game was restarted contributions returned to significant levels. One explanation of this result is that reciprocating participants withhold contributions to punish free riders, but are willing to wipe the slate clean when the experiment is restarted. More directly, Fehr & Gaechter show that when participants have some way, other than withholding contributions, to punish free riders, they do so and contributions increase.

The work of Fehr and Gaechter piqued the interest of other researchers who have confirmed their main result and extended the analysis in other interesting directions. Bowles, Carpenter and Gintis (2001) develop a team production model based on reciprocity which predicts punishment in equilibrium and test the model experimentally. The experiments substantiate the major hypothesis generated by the model - transferring residual claimancy to a team increases reciprocator's propensity to punish shirkers and this, in turn, increases the productive efficiency of team production. Additionally, Carpenter (2001) shows the effectiveness of mutual monitoring need not be attenuated in large groups. Page & Putterman (2000) also confirm that punishment is used to maintain or increase contributions to a public good and show that communication among players, which usually increases contributions, has mixed effects when combined with sanctions. Finally, Sefton, Shupp and Walker (2000) ran an experiment in which players could reward and sanction other players. When both rewards and sanctions are allowed, they show that initially, rewards are used, but by the end of the experiment rewards abate and players rely mainly on sanctions.

The experiments discussed above demonstrate two behavioral facts: first, subjects will punish others even at some cost to themselves. This is a very robust result seen in a variety of choice environments. Second, punishment is used to elicit contributions in social dilemma situations. While these facts are important and relate to ingroup processes, the model we have in mind requires punishment to be generalized when smaller groups are subsumed into larger populations. With this in mind, Carpenter, Matthews and Ong'ong'a (2001) ask whether people internalize the heuristic of punishing free riders and simply punish all deviations from the group norm, regardless of the group membership of the norm violator. If we can demonstrate that punishment diffuses past small group boundaries and can be maintained in a larger, more opaque population, then we have the behavioral foundations for generalized class action on a large scale.

Figure 4 presents data from the Carpenter, Matthews and Ong'ong'a (2001) experiment. The top three lines plot the average level of contributions in three treatments: the control which is a standard public goods game, the mutual monitoring game in which participants can monitor and punish people in their group, and the social reciprocity treatment where players can punish free riders in a completely separate group, in addition to the members of their own group.

the common pool resource game in which players contribute by refraining from extracting a commonly held resource. This work has been extended in Ostrom, Walker and Gardner (1994) and Moir (1998).

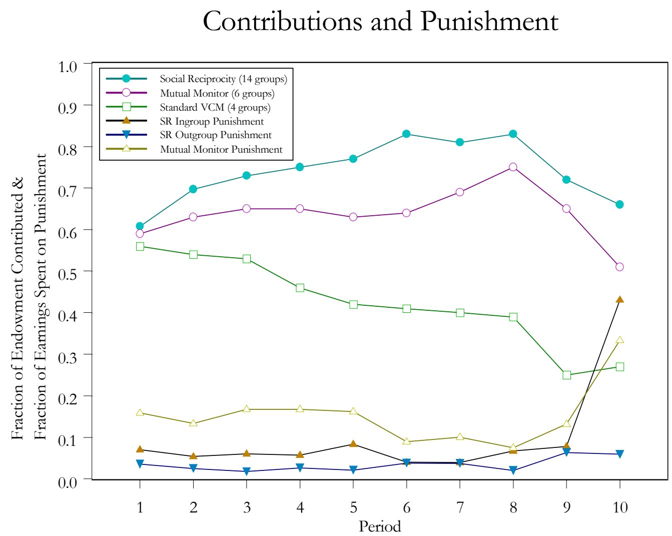

Figure 4: Average Contributions and Expenditures on Punishment (source: Carpenter & Matthews 2001)

The bottom three lines plot the average expenditure on punishment in the two punishment treatments. Remarkably, not only do people punish free riders in their own group which can be rationalized in terms of eye for an eye like reciprocity, they also punish free riders in the other group despite the fact that they can never benefit from getting this person to contribute in the future. Furthermore, the free rider in the other group also imposed no harm (i.e. from the lower overall contribution level) on the punisher. The authors take this a strong evidence in favor of the idea that, although punishment norms may evolve in small ingroups, once internalized, punishing behavior can operate in larger populations.

Also notice that punishment increases contributions in both treatments to levels greater than the control which demonstrates the standard decline in contributions over trials. It is also the case that, social reciprocity increases contributions even more than simple ingroup punishment which implies that large populations in which people can punish not only their own group members but also people transgressing a contribution norm in other groups achieve higher payoffs than populations in which punishment is localized.

5 Concluding Remarks

Contrary to the standard, prisoner's dilemma representation of collective action attributed to Olson (1965) which explicitly challenges the theory of class consciousness and class action offered by Marx, the Marxian approach seems to be not too far from the mark when one employees more sophisticated modeling tools (e.g. bounded rationality and evolutionary game theory) and pays close attention to the behavioral literature.

We have offered a view of economic and political agents who are purposive like the standard representation, but allow them to learn and be subject to biases that have deep empirical support. When we combine our empirical regularities (e.g. an ingroup bias, a propensity to punishment etc.) with a model that allows for imperfect agents we see that equilibria emerge in which collective action occurs and is sustained.

While we feel we have made a strong case for the behavioral relevance of Marx's concept of collective and class action, more work is planned. First, we anticipate our model can be improved by examining the link offered by Sabia (1988) more closely. Specifically, we plan to model the interaction between the internalization of norms in small groups and their propagation in larger populations once internalized. To match our theory, we also plan to run experiments that would allow players to participate for some time in small groups and then, hopefully after norms evolve, form larger groups to see if small group processes can be adopted by larger groups.

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