A Social Custom Model of Collective Action

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I Introduction

The logic of collective action, because of its public good and Prisoners' Dilemma characteristics, has defied satisfactory explanation within the framework of conventional economic analysis. Olson (1965) argued that in large group contexts collective action would be impossible in the absence of compulsion. This is because there is a dominating free-rider incentive not to join if joining is costly and the benefits of collective action accrue to joiners and non-joiners alike. Booth (1985) showed in the context of trade union membership that collective action can be explained if individuals are sensitive to reputation effects. Booth's work represents an application to the collective action literature of the social custom model developed by Akerlof (1980). As we demonstrate in the course of this paper, Booth's model is essentially equivalent to the discrete choice analysis suggested by Schelling (1978). In each of Booth's and Schelling's models individuals are treated as identical and therefore as homogeneous with respect to their sensitivities to reputation effects - or, in Schelling's terms, to their critical mass points.

In the current paper we offer a model closely akin to Akerlof's social custom model and which encompasses the Schelling model by generalising the analysis of collective action to the case where individuals are heterogeneous with respect to their 'cross-over' points. We argue that this more general formal model is in fact closer to the spirit and substance of much of Schelling's discussion than is the special case in which individuals are assumed to be identical. We show however that the results derived in the latter model do not hold for the case in which individuals differ. We find that many of Schelling's formal results follow from the particular assumption of homogeneous individuals. Much richer possibilities arise when we relax this assumption.

Furthermore we believe that the model yields important insights into a number of issues relating to the explanation of collective action. These are discussed in Section III of the paper. In particular, we address the issues of; the origin and persistence of social norms, the sustainability of collective action, the role of Kantian behaviour and the significance for economic analysis and methodology of the interdependence of individual and collective behaviour. Section IV then highlights the empirical content of the model and Section V concludes with suggestions for further work. The next Section of the paper develops the formal model.

II The Formal Model

Our concern is with situations in which the individual has a choice between participating in collective action or of free-riding. The outcome of the action is assumed to be a public good. Whether or how the provision of the public good depends upon the degree of support for - i.e. the proportion of the potential population participating in - the collective action is not relevant to our concern. We are interested in identifying the factors which determine the level of participation. For ease of exposition we specify initially simple payoff functions, but show later that our results are readily generalisable.

Let,

$$R_i = w - ds + \varepsilon_i \mu s \qquad (1)$$

where

- R_i is individual i's payoff or utility.
- w is the value of the public good provided as a result of the collective action. We assume that the population is sufficiently large that the individual disregards the marginal contribution his/her membership makes to the magnitude of w.
- d is the private cost to the individual of participating in the collective action and, for simplicity, is independent of the level of membership.
- μ is the degree of support for the collective action, i.e. the proportion of the population who join.
- s = 1 if the individual joins; 0 otherwise.
- ε_i is the reputation-derived benefit to the individual of participating in the collective action and depends upon the degree of support.

It is necessary to say more about the characteristic ε_i, as different interpretations are possible in different contexts. In this paper we are interested essentially in the impact on collective action of social norms. In particular, we investigate the consequences that stem from the assumption that there is a social norm or custom which invokes individuals to join collective action rather than to free-ride. We shall have more to say later about the origin of such norms. We interpret ε_i as a measure of the valuation by individual i of the reputation effects that derive from acting according to the social custom. In this the model follows Akerlof (1980). Alternatively, we could have specified ε_i to proxy the shame effects derived from non-membership. There is, however, no formal difference between the two. The latter would have been closer to the view espoused by Elster (1989, pp. 105.) of a social norm as generating, "...the propensity to feel shame and to anticipate sanctions by others at the thought of behaving in a certain, forbidden way."

Nevertheless, our model is close to the argument made by Elster (1989, pp. 151.) that, "Actions are shaped jointly by norms and self-interest." In equation (1) the payoff represents a single function valuing both pecuniary factors (w, d) and non-pecuniary ones (ε_i). From (1) it follows that,

$$R_i^J = w - d + \varepsilon_i\mu ,$$

and

$$R_i^{NJ} = w ,$$

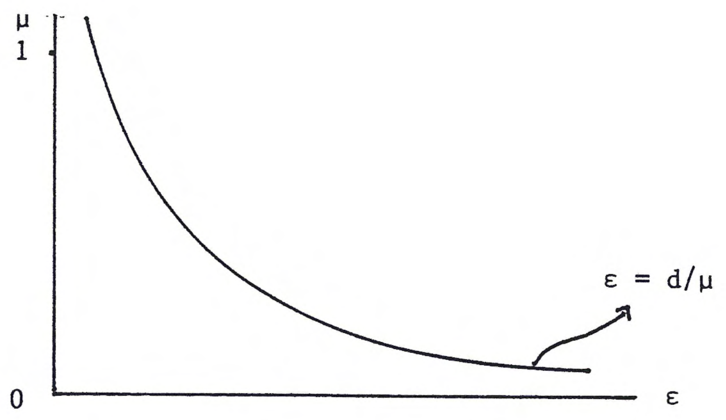
where R_i^J and R_i^{NJ} are the payoffs from joining and not joining, respectively. We assume that the individual will join the collective action so long as $R_i^J \geq R_i^{NJ}$,

i.e., $$w - d + \varepsilon_i\mu \geq w,$$

or, $$\varepsilon_i \geq d/\mu . \qquad (2)$$

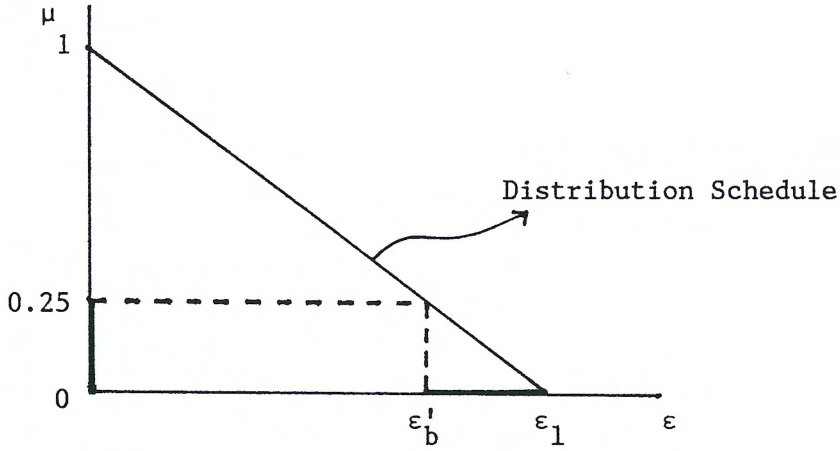
The fact that w drops out of the inequality justifies our earlier statement that the current paper will not address the determinants of w. We can represent diagrammatically the relationship described in (2) above by the decision schedule in Figure 1.

Figure 1.



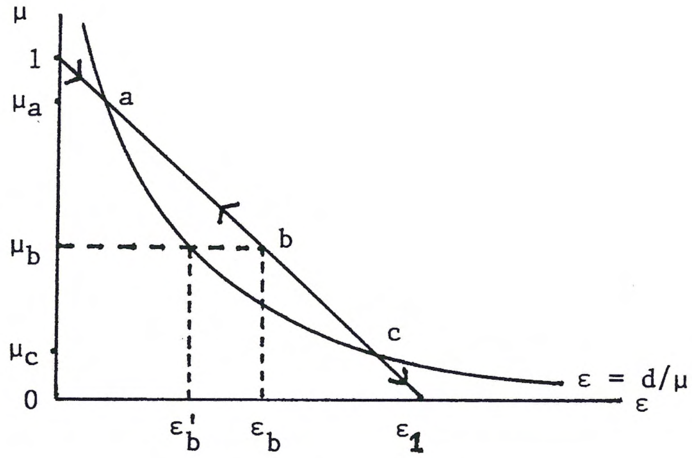
To determine possible levels of membership of the collective action we need to specify how the ε_i characteristic is distributed across the population. In the course of the paper we shall consider different possible distributions as the sensitivity of collective action to this distribution is of central interest to us. Initially, however, we consider the case of a uniform ε-distribution. We assume that ε is distributed unifrormly between a lower bound, say zero, and an upper bound, ε_1. This distribution schedule is depicted in Figure 2.

Figure 2



One property of the model is that if $\mu = 0.25$ these joiners will be those individuals in the upper quartile of the ε-distribution. We can now integrate the two schedules to consider the possible equilibria in the model. An equilibrium occurs at μ^* when condition (2) is satisfied for the value of $\mu = \mu^*$ for just μ^* of the population. More simply, a necessary, though not sufficient condition, for equilibrium is that those joining (not joining) cannot make themselves better off by not joining (joining). Consider Figure 3a below;

Figure 3a
Case 1



At point b, μ_b of the population is joining the collective action. These are the individuals for whom $\varepsilon_i \geq \varepsilon_b$. The decision schedule tells us that any individual with $\varepsilon_i \geq \varepsilon_b'$ will join. This condition is satisfied for all those joining and, additionally, for those others with $\varepsilon_b' \leq \varepsilon_i < \varepsilon_b$. From this we assume that membership will grow: depicted by the arrow at b. Conversely, for $\mu > \mu_a$ some joiners have insufficiently large ε_i (are insufficiently sensitive to the reputation effects of membership) to sustain their participation and so μ falls towards μ_a. For $\mu < \mu_c$ membership is too small to generate sustainable interest even amongst individuals with relatively high levels of ε_i, i.e. who are highly sensitive to the reputation effects derived from joining. If, in the context of Schelling's famous example, fewer than μ_c of the faculty attend the first seminar, then attendancse will drop to zero in the future. In case 1 in Figure 3a there are three equilibria: $\mu = 0$, $\mu = \mu_a$, $\mu = \mu_c$. The first two are (locally) stable, the third is unstable. If any proportion of the faculty greater than μ_c attends the first seminar, membership will settle at μ_a. μ_c, then, is the critical mass or threshold level of membership. For a given ε-distribution, Figure 3a represents one of three possible outcomes consistent with equation (1). The other two cases are depicted in Figures 3b and 3c below:

Figure3b
Case 2

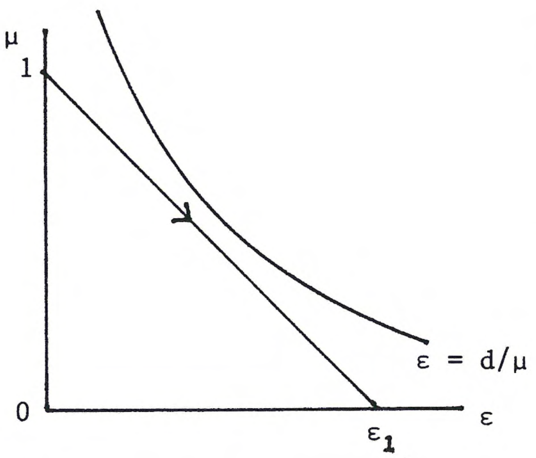
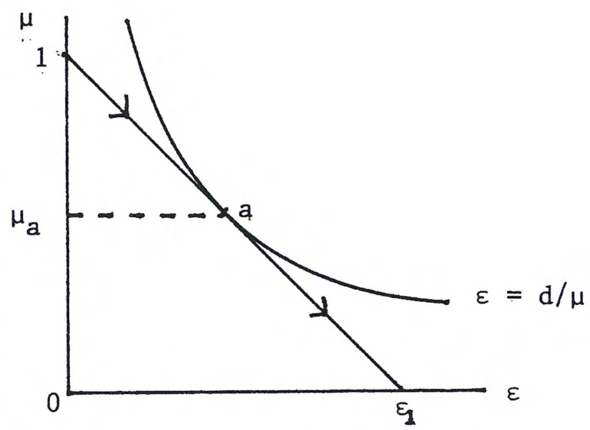


Figure 3c
Case 3

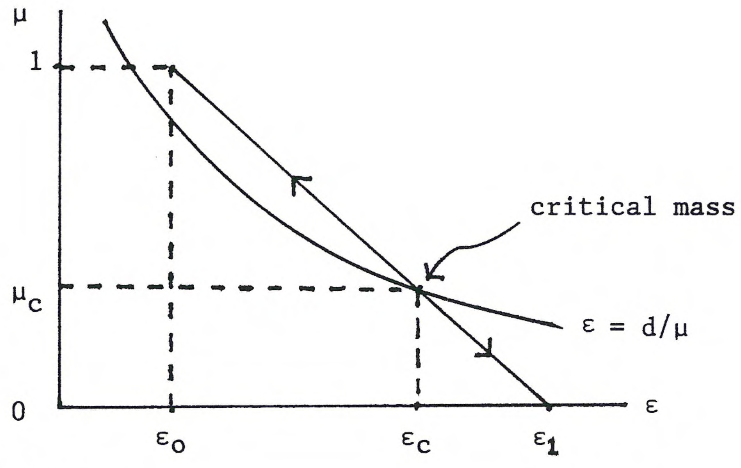


In each of the two cases above the only stable equilibrium is at $\mu = 0$, where no collective action occurs. In case 3 there is an additional equilibrium at $\mu = \mu_a$, but this is clearly unstable.

The existence of stable equilibrium levels of collective action, therefore, depends upon the relative positions of the decision and distribution schedules. We can demonstrate this with some simple comparative static exercises.

(i) The more sensitive are individuals to reputation effects the further to the right is the ε-distribution with the consequences that the stable equilibrium level of non-zero membership is higher and the critical mass level is lower. This is shown in Figure 4 where we see that 100% membership is now a stable equilibrium.

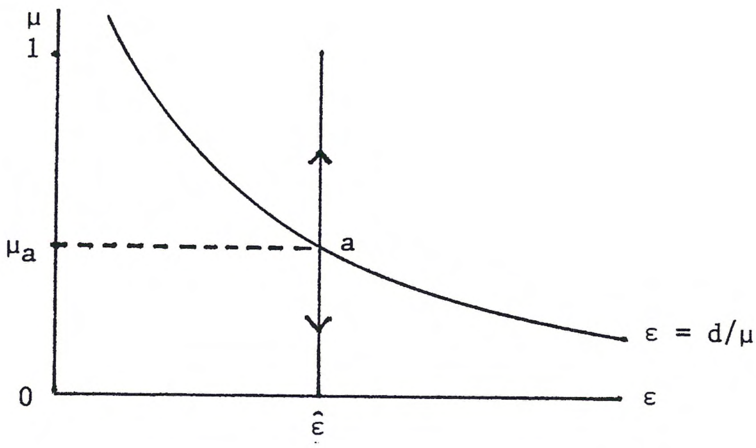
Figure 4



(ii) If the cost to the individual of joining in collective action, d, rises then the decision schedule shifts to the right taking us from Case 1 to Case 3 through Case 2. The stable equilibrium level of μ falls - eventually to zero.

(iii) If the slope of the distribution schedule changes, reflecting a different degree of heterogeneity in ε_i across individuals, then the possible outcomes change. Let us consider what happens to collective action if, instead of individuals varying with respect to ε_i, all individuals are identical with $\varepsilon_i = \hat{\varepsilon}$. This is shown in Figure 5. The decision schedule still derives from equation (1) above.

Figure 5

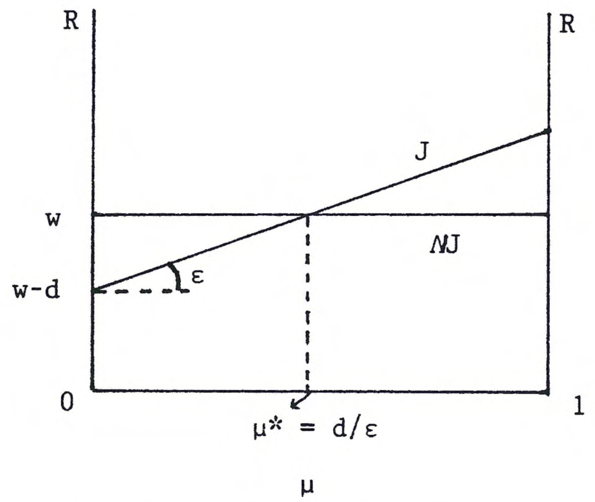


We have assumed so far that an individual will join in collective action so long as the payoff from doing so is at least as great as that from not joining. In other words, if the two options have the same payoff the individual will join in the action. Thus when $\mu=\mu_a$ in Figure 5 each individual has $\hat{\varepsilon} = d/\mu$ and so all will join. Hence, $\mu=\mu_a$ is not an equilibrium. For later purposes it is useful to note now that point a would be described as an (unstable) equilibrium had we adopted the assumption that individuals change their behaviour only if they can improve their payoff. That is, when the two payoffs are equal, individuals chose to maintain their previously selected behaviour instead of, when indifferent, opting to join the collective action. With such an assumption, when $\mu = \mu_a$ in figure 5 and individuals are just indifferent between joining and not joining it becomes the case that the proportion μ_a will continue to join. μ_a is unstable, however, because if just one more individual joins (leaves) then the consequently stronger (weaker) reputation effects cause everyone to join (leave) the collective action. This outcome occurs because individuals are insufficiently heterogeneous with respect to the ε_i characteristic. The result is described aptly by the aphorism, 'Birds of a feather flock together.' Each individual has the same critical mass. This explains the result found by Booth (1985). It also enables us to understand better the properties and limitations of the model associated with Schelling. We turn now to show formally how the latter model is encompassed within the one we have developed in this section of the current paper.

Schelling's model of collective action.

Schelling's model is common currency in explanations of collective action (see Schelling (1978) and Elster (1989)). The model provides a cogent method for understanding more clearly various important determinants of collective action. To illustrate the model we consider the following example depicted in Figure 6.

Figure 6

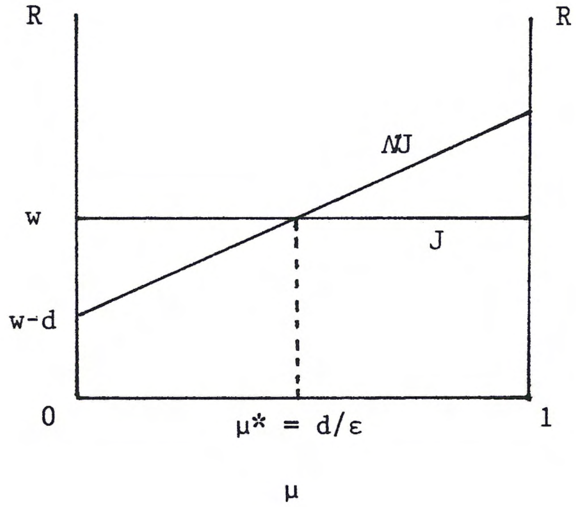


The J-schedule represents the payoff to an individual who participates in the collective action. NJ refers to the non-participation payoff which is dependent on the level of participation. The two payoffs are equivalent to those in equation (1) above. The diagram tells us that if participation exceeds μ^* joining is preferable to not joining and so the level of collective action tends to unity. Conversely, if $\mu < \mu^*$ activity atrophies to zero. Following Schelling's assumption that individuals do not change their behaviour if they are indifferent between two actions, then $\mu = \mu^*$ is an equilibrium. However, it is unstable given the foregoing argument.

This model informs us, therefore, that if the payoffs to each individual are as represented above and if individuals are identical then the only stable equilibria occur when either everyone cooperates in collective action or when no-one does. We have shown in our more general model however that this conclusion follows directly from the assumption of identical individuals. If instead individuals are sufficiently heterogeneous with respect to ε_i (or μ^*, in terms of the Schelling diagram) then stable intermediate equilibria are indeed possible. See Figure 3a for such an example. The Schelling diagram can be seen as a special case within the more general model, occurring when $\varepsilon_i = \hat{\varepsilon}$. In his less formal analysis of critical mass models Schelling (1978, pp.91-110) discusses the cases in which different people have different cross-over points (or ε_i's, or μ^*'s in the more formal models above). As demonstrated, our model is able to offer a rigorous framework for the discussion of these cases.

Having looked in Figure 6 at the case of a Schelling diagram in which there is an unstable intermediate equilibrium, let us now consider an example of what has been termed as a stable intermediate equilibrium. This is represented in Figure 7.

Figure 7



The argument that μ^* is stable goes as follows. If $\mu > \mu^*$ it is better not to join. Conversely, if $\mu < \mu^*$ it is better to join. Thus, if there is any orderly adjustment, the outcome will tend to μ^*.

The payoff function which corresponds to the schedules drawn in Figure 7 is given by:

$$R_i = w - d(1 - s) + \varepsilon_i\mu(1 - s) \qquad (3)$$

Hence, $R_i^J = w,$

and $$R_i^{NJ} = w - d + \varepsilon_i \mu .$$

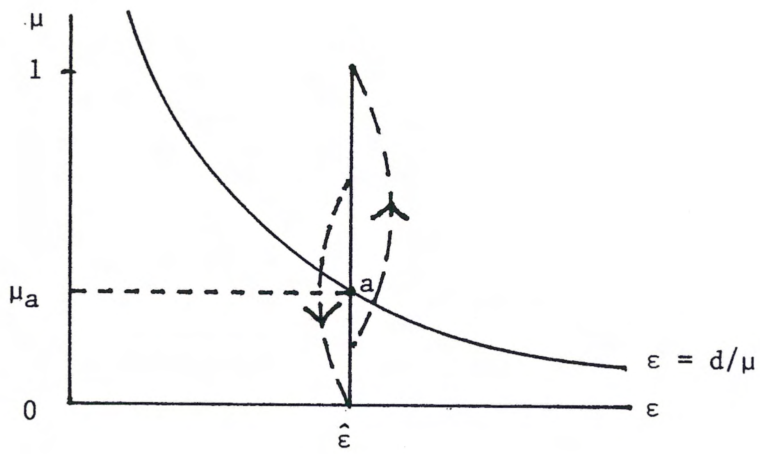
Suppose that the individual joins if $R_i^J \geq R_i^{NJ}$, i.e.,

$$w \geq w - d + \varepsilon_i \mu,$$

or, $$\varepsilon_i \leq d/\mu.$$

In terms of the general model that we are proposing this particular case with identical individuals can be represented in Figure 8.

Figure 8



Any individual with $\varepsilon_i \leq d/\mu$ will join the action. Thus, the joiners are the individuals with the lowest values of ε_i. If $\mu > \mu_a$ then an individual will join only if $\varepsilon_i \leq d/\mu_a$. But as $\varepsilon_i = \hat{\varepsilon}$ for all i, then for $\mu \geq \mu_a$ of the population $\varepsilon_i > d/\mu_a$ and hence no individual will join. Conversely, for $\mu < \mu_a$ each individual will join. This is represented by the arrows in Figure 8 above. Consequently, $\mu = \mu_a = d/\hat{\varepsilon}$ is not a stable equilibrium. (This is just another way of showing the 'birds of a feather' result). This is contrary to Schelling's conclusion (1978, pp. 226). Stability follows in Schelling's model from the crucial but arbitrary supposition of ,'any kind of orderly adjustment.' But even if we grant this the more general case in which there are heterogeneous individuals generates a wider variety of results. This is shown below in Figure 9.

Figure 9

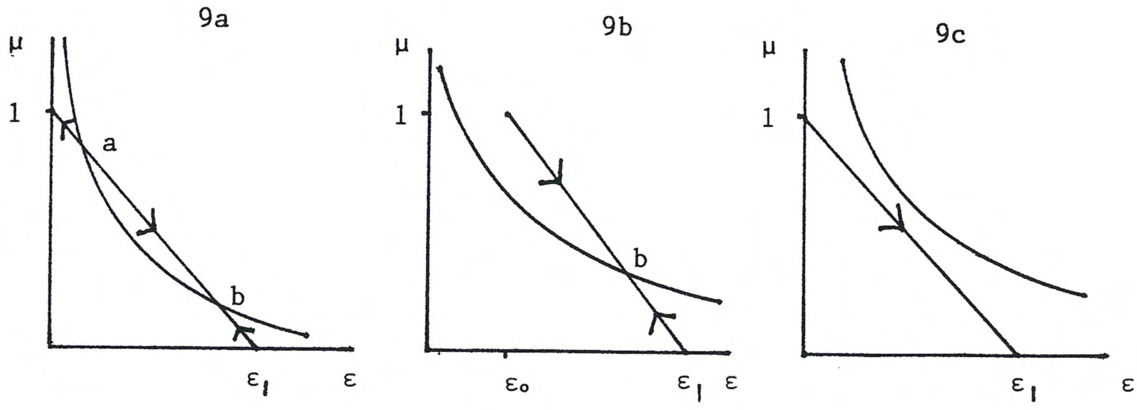


Figure 9 shows how for a payoff function as given in equation (3) the equilibrium possibilities when individuals are heterogeneous are richer than suggested in Figure 7 for the case of identical individuals. In cases 9b and 9c there is only one equilibrium, at $0 < \mu_b \leq 1$ and at $\mu = 0$, respectively. In case 9c there are stable equilibria at $\mu = 1$ and at $\mu = \mu_b$ and an unstable equilibrium at $\mu = \mu_a$. The analysis shows how the possible types of equilibrium level of collective action depend not only on the relative payoffs, but also on both the degree of heterogeneity within the population with respect to the cross-over point and the relative magnitudes of the distribution and decision schedule parameters.

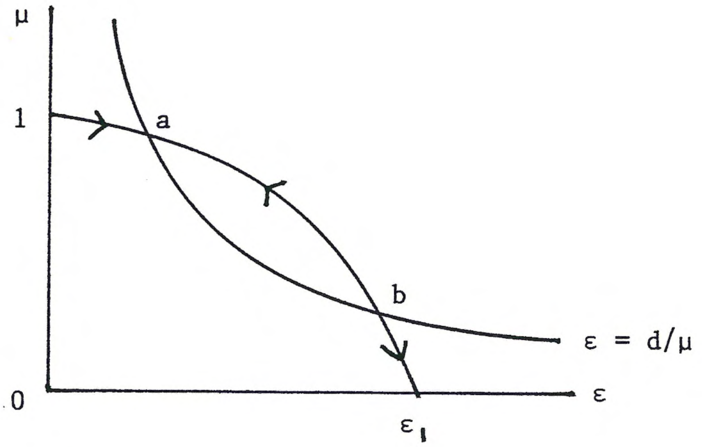
In the next section of the paper we consider ways in which the simple model which has been developed so far can be extended to cover other issues in the analysis of collective action.

III Extensions of the model

(a) *Generalising the distribution and decision schedules.*

So far we have assumed that the decision schedule can be represented by a simple hyperbolic function and that the distribution schedule is linear. The former assumption follows from the linearity of R_i^J and R_i^{NJ} in μ, and the latter from the assumption of uniformity in the distribution of ε_i. The model is robust to changes in these assumptions. This has been shown by Naylor and Cripps (1988) for the particular application to the issue of trade union membership. For example, if we assume that ε_i has a distribution described by the general continuous density function $f(\varepsilon_i)$, then we can see from Figure 10 that the properties of the model are unaltered.

Figure 10



The case represented in Figure 10 has the same properties as that depicted in Figure 3a for the uniform ε-distribution.

(b) *Symmetric reputation effects.*

When reputation effects accrue equally to both joiners and non-joiners then we find that positive equilibrium levels of collective action below 0.5 are not possible. The critical mass exceeds one-half. We represent symmetry of reputation effects by amending equation (1) to:

$$R_i = w - ds + \varepsilon_i\{\mu s + (1-\mu)(1-s)\}$$

Hence, $$R_i^J = w - d + \varepsilon_i \mu$$

and $$R_i^{NJ} = w + \varepsilon_i(1-\mu).$$

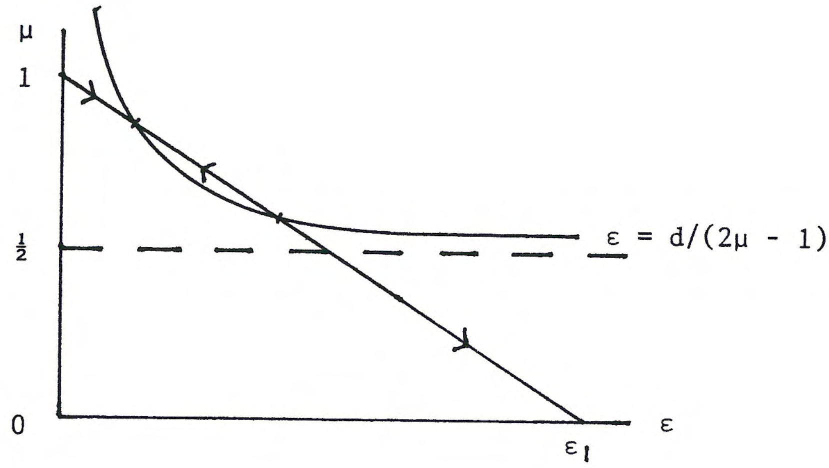
The individual will join if:

$$w - d + \varepsilon_i \mu \geq w + \varepsilon_i(1-\mu)$$

i.e., $$\varepsilon_i \geq d/(2\mu-1).$$

The decision schedule now has an asymptote at $\mu = 1/2$, as in Figure 11 below.

Figure 11



Consequently, the critical mass for membership exceeds one-half. More generally, whenever the payoff for non-membership is increasing in (1-μ) we observe a membership threshold strictly greater than zero.

(c) *Believers and Non-Believers.*

Following Akerlof (1980) we can distinguish between believers and non-believers in the social norm or custom. Here we continue to specify the social norm as invoking individuals to join in the collective action, rather than free-riding. We re-write equation (1) as :

$$R_i = w - ds + \varepsilon_i \mu s - g(1-s)b - h(1-s)(1-b) \quad (4)$$

We now interpret μ as the proportion of individuals in the population who believe in the social custom.

b = 1 for an individual who is a believer
0 for a non-believer

g is the loss suffered by a believer who breaks the social custom, where $g \geq 0$.

h is the corresponding loss suffered by a non-believer, where $g \geq h \geq 0$.

This approach is consistent with Elster's discussion (1989, pp. 105) where he argues that, "... one can define, discuss and defend a theory of social norms within a wholly individualstic framework. A norm, in this perspective, is the propensity to feel shame and to anticipate sanctions by others at the thought of behaving in a certain forbidden way." In Elster's terms we could think of ε_i as an indicator of shame and g or h as reflecting guilt which is independent of the actions of others as it is more deeply internalised.

From equation (4) we can derive the joining condition for a believer:

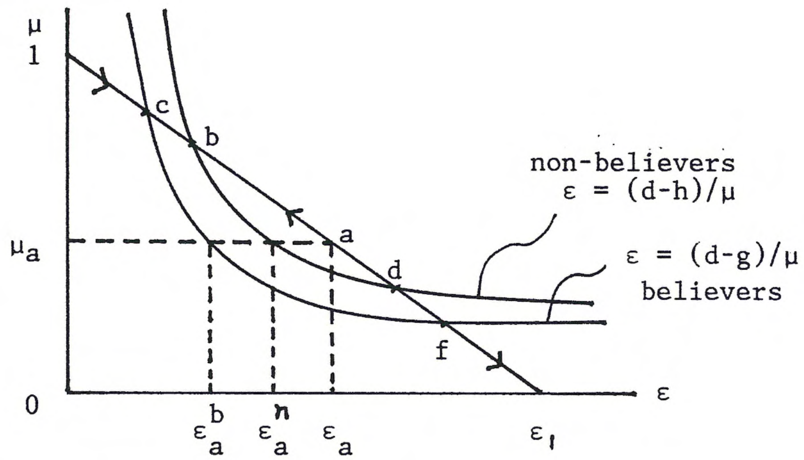
$b = 1 \Rightarrow \qquad R_i^J = w - d + \varepsilon_i \mu,$

and $\qquad R_i^{NJ} = w - g.$

Hence, $\qquad R_i^J \geq R_i^{NJ}$ iff $\varepsilon_i \geq (d-g)/\mu.$

That is, an individual who believes in the social custom will join if $\varepsilon_i \geq (d-g)/\mu$. Similarly, a non-believer will join if $\varepsilon_i \geq (d-h)/\mu$. We can now derive the equilibrium levels of collective action and belief in the social norm. Consider the case represented in Figure 12 below.

Figure 12



If $\mu = \mu_a$, then the believers are the individuals for whom $\varepsilon_i \geq \varepsilon_a$. Any believer with $\varepsilon_i \geq \varepsilon_a^b$ will join the collective action and as $\varepsilon_a > \varepsilon_a^b$ this condition is satisfied for all believers. Additionally, there are some non-believers for whom $\varepsilon_i \geq \varepsilon_a^n$ and hence who will join. Thus the proportion joining, say ϕ, exceeds the proportion believing and, following Akerlof, we assume that the proportion believing rises. In equilibrium $\mu = \phi$. Hence, point a is not an equilibrium as $\phi > \mu$ and μ rises. In this way we can show that there is a stable equilibrium at $\mu = \phi = 0$ and two ranges of stable equilibria occurring between c and b and between d and f. The ranges of equilibrium occur because of the distinction between believers and non-believers in the social custom. If, by setting g=h, we collapse the model to the previous one where no such distinction is made, then the ranges reduce to single point equilibria. Conversely, as the difference between g and h grows then the ranges of stable equilibria widen. If h is sufficiently small, i.e. if non-believers suffer little or no disutility from free-riding, then the interval b-d disappears and there is just one wide range of stable intermediate equilibria. The implication of multiple ranges of equilibria is that we can become locked into lower levels of collective action than is otherwise achievable. A further implication is that there is no guarantee that the outcome will in any sense be socially optimal.

This extension of the model offers a possible escape from the charges of 'structureless agency' or 'agentless structure' (see Carling (1986)), or of reduction to either homoeconomicus or homosociologicus (Elster (1989)). This is because within the model it is clear that individuals' actions are influenced both by self-interest and by social norms and that the pervasiveness of the social norm is itself affected by the actions of individuals. We do not have yet a theory of how social norms come into existence, but we do have a framework within which to study the endogeneity between individual actions, social norms and collective actions.

(d) *The origin of collective action.*

There are two important and related aspects of collective action which have not yet been addressed in this paper. The first concerns the motivation of latent collective action when $\mu = 0$ is a stable equilibrium. Even if there exists a $\mu^* > 0$ which is a potential stable equilibrium, such as point a in Figure 3a above, how might the outcome jump from $\mu = 0$ to $\mu = \mu^*$? Secondly, where does the social norm itself originate? One answer to the first question is given in (d) below and involves Kantian behaviour by a subset of the population. Here we offer a different solution which we believe also goes part of the way towards an answer to the second question.

Suppose that in some collective action context there is an initial payoff given by:

$$R_i = w + ds\mu.$$

Then the individual will join, independent of the level of μ, so long as $d \geq 0$. In other words, the individual has a dominant preference for joining independent of the actions of others. The result is that all will join. An example of this is where a trade union is set up as a friendly society providing a private benefit which exceeds the private cost of membership, and which rises with μ. Over time, however, the union might change its its role to one of providing only a public good (e.g. higher wages) and therefore risking the free-rider problem. In the absence of either reputation or social custom effects or of compulsion, membership will fall to zero as now each individual has a dominant preference to free-ride. The public good will not be provided because of the failure of collective action.

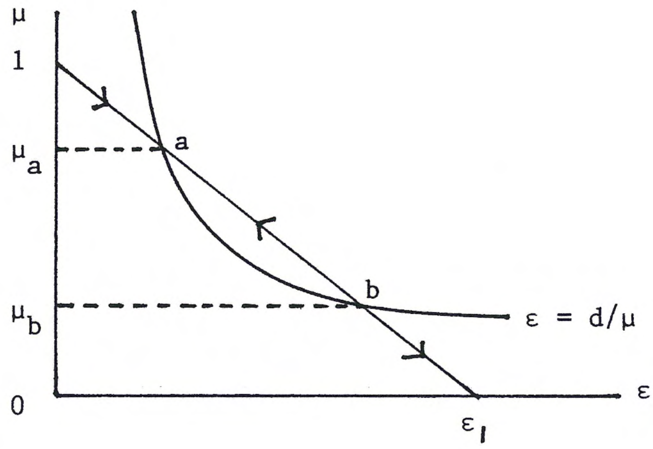
However, in the former regime in which the union is rewarding workers with private benefits there will be an incentive for the union leadership to anticipate the free-rider problem and hence inculcate members with a sense of duty to join in collecrive action rather than free-ride. If the union is successful workers will internalise the emotions of shame or guilt associated with not joining and so the payoffs will come to correspond to those capable of sustaining membership or collective action at some positive level.

This argument justifies the assumption that it might be possible to start at $\mu = 1$ rather than at $\mu = 0$. This would mean settling on an equilibrium at $\mu = \mu_a > 0$ in Figure 3a, for example, rather than being locked in at $\mu = 0$. As well as offering an explanation of the growth and persistence of organisations potentially susceptible to the free-rider problem, the model also suggests a mechanism by which an identifiable and far-sighted group has an incentive to generate a particular social norm of group loyalty. What is lacking is an explanation of why individuals are amenable to any such edict or norm. This, however, is more the domain of social psychology.

(e) *Kantian Behaviour.*

Consider again the simple model representd in Figure 13:

Figure 13



It is clear that if we start at any level of $\mu > \mu_b$ then the outcome will tend towards μ_a. However, as $\mu = 0$ is a stable equilibrium, if we start with zero membership (or any value of $\mu < \mu_b$) there will be no tendency for collective action to develop. There is scope here for collusion amongst $\mu > \mu b$ individuals to initiate collective action. Alternatively, $\mu = \mu_a$ will occur so long as a proportion $\mu \geq \mu_b$ of the population consists of individuals whose participation is not conditional on participation by others. Such behaviour might be described as Kantian. This acts as a catalyst for cooperation by others and takes the outcome to μ_a. Such a trigger for collective action appears in a number of discussions (see Elster (1985, 1989) and Hardin (1982)).

IV Empirical Content

We have argued that the formal model presented here offers a more rigorous and richer framework within which to analyse the logic of collective action than do previous models. We also suggest that its capacity to generate empirically testable predictions is correspondingly larger. The model also bridges some of the gaps that have traditionally divided economics from other analyses within the social sciences. For example, sociological literature has distinguished between the 'isolated mass' and 'integrated individuals' (see Kerr and Seigel (1954)).The more isolated the mass the more we expect individuals to be influenced by group norms and reputation effects. Within particular empirical contexts we can identify different groups and rank them with respect to these characteristics and from our model make testable predictions about their behaviour. For instance, we would expect workers in industries like coal-mining to have stronger norms of group solidarity than workers in agriculture who are traditionally more integrated into their wider local communities. In terms of our model we translate this as meaning that the ε-distribution schedule lies further to the right the more 'isolated' is the 'mass' with stronger group norm effects pushing the decision schedule to the left. The results vary according to the specification of the parameters but generally predict higher levels of collective action, such as union membership or strike solidarity, amongst miners than amongst farmworkers. See Naylor (1989) for a fuller application of the model to strike activity and Naylor and Cripps (1988) for the case of trade union membership.

V Conclusions

We have developed a formal model of collective action which brings together features associated in particular with the work of Elster, Schelling and Akerlof. We would argue that the model is capable of application to a wide range of empirical contexts involving issues of collective action where the free-rider problem renders conventional economic analysis inadequate. The approach offers insights into the historical development of such groups as trade unions and could be empirically tested against such processes. As Hardin (1982) has shown the results obtained here can carry over from the issue of collective action to that of the multi-person prisoners' dilemma.

A number of aspects of the model deserve further development. Here we indicate two such aspects. First, we have treated the ε_i distribution as determined exogenously. Alternatively, we could follow Jones (1984) and make our ε_i parameter endogenous within the model. One way of doing this would be to make ε_i itself dependent upon the individual's decision with respect to membership of collective action. Or we could think of the individual as influenced by a vector of social norms with his/her attitude to each affected through ε_i by his/her behaviour with respect to the others. Second, we have abstracted from the economic structure or game in which the collective action is, or is not, taking place. Clearly, a complete model needs to specify the interactions between the economic parameters and the social custom influences on collective action. We have tried this elsewhere for the issue of trade union membership and wage determination (see Naylor (1989)) but do not pursue this here as any particularisation is likely to be context-specific.

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