TOWARD A THEORY OF INTERPERSONAL CONTRIBUTIVE JUSTICE[1]

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Toward a Theory of Interpersonal Contributive Justice

Abstract

The concept of interpersonal contributive justice is defined as a normative standard held by participants in an interpersonal interaction for how much each participant should contribute. This is parallel to the well-known concept of distributive justice, but applies to actions that create rewards (inputs) rather than rewards themselves (outcomes). In this paper contributive justice is compared to distributive and procedural justice and it is argued that such a standard is a part of most interpersonal interactions. Identifying a standard of contributive justice can help understand both actions and emotional responses to actions. A formal model of group discussion including the concept of contributive justice is developed and compared to data from a laboratory study of 4-person discussion groups. Results show how an assumption of contributive justice standard can help explain how task oriented discussion groups achieve both differentiation in amount of talking and equilibrium.

Toward a Theory of Interpersonal Contributive Justice

Introduction.

In this paper I introduce and explicate the concept of "interpersonal contributive justice". This is defined, informally, as the expectations people have for how much actors should contribute to an interpersonal interaction, that is, what is a "fair" contribution. My primary theoretical assumptions are: 1) that participants in all interpersonal interactions *have* a standard of contributive justice, that is, they have an idea how much each should contribute; 2) this standard affects behavior; people try to adjust their behavior to conform to the standard; and, 3) this standard affects emotions; people who see their situation as 'unfair' experience negative emotions while those who see their situation as 'fair' experience satisfaction. However, 4) contributive standards are not the only factors affecting behavior and emotions. I discuss briefly how this concept is related to other social psychological concepts of interpersonal justice, what some of the possible contributive justice standards are, and apply these ideas to a specific interpersonal interaction, task oriented discussion groups, with an effort to examine how contributive standards interact with other influences on behavior in discussion groups.

Definition and Explication of the concept

Definition: Interpersonal Contributive Justice is

- a normative standard
- held by participants in an interpersonal interaction
- for how much each participant should contribute
- (In some cases- relative to others in the interaction).

Standards of contributive justice include: Equality; Inequality; Minimum/maximum.

The domain of this theory (that is, the phenomena to which it applies) is interpersonal interaction, meaning situations in which two or more human beings engage in a series of acts each of which can have evaluated consequences for others. Restriction of domain to interpersonal interaction means that the present formulation is not intended to apply to a societal level although, like distributive

justice, contributive justice can be assessed at a societal level. For example, Gomberg, (2007) relates "contributive justice" to issues of racism and equality of opportunity- contributive justice exists when all members of society are equally equipped to make valued contributions to society. However, as Jasso (1983) points out, what is fair at the individual level may not always be fair at the aggregate level; this theory is not intended to apply directly to the societal level.

Contributive justice is one of a set of concepts involving standards of 'fairness' in interpersonal situations. In general, discussions of fairness focus on the question of how the *outcomes* (benefits or costs) experienced by participants in social situations are perceived as just or fair. My argument is that we also need explicit attention to congruence between expectations for *inputs* (actions by participants that create benefits or costs to others) and actual inputs.

Interpersonal Contributive Justice in Sociological Theory

The concept of contributive justice fits within the more general frameworks of three groups of sociological theories. First, it is a type of exchange theory. Like other theories of interpersonal justice, this uses the basic concepts of social exchange theory; actors, acts, evaluations of acts by actors and recipients, a time sequence and variations in how acts are combined into group product and rewards (direct, indirect, reciprocal, network, etc). Second, it is a type of legitimacy theory; other related examples include status value theory of distributive justice and procedural justice. As a legitimacy theory, it posits a normative standard, which tells an actor what to do or expect in a given situation. Actors assume that they share these standards with others in the situation, that the sources of the standards are themselves legitimate and that in addition to predicting what usually happens, it says what is right or proper to happen. Third, contributive justice is a type of 'control' or 'balance' theory; as such, it posits a kind of template of what should happen against which actors compare their perceptions of what has actually happened. When there is congruence, actors are satisfied with the situation and when there is not they experience distress and act to either to change the situation or to revise their template.

Contributive justice and exchange theory. Exchange theorists distinguish between reciprocal exchange (A does something for B without settling in advance what B will do, and at a later time B does

something for A) and negotiated exchange (A and B agree on what each will do for the other before either acts) (Molm et al, 1993; 1994; 2003). Also, some exchanges may be direct (A benefits B, B benefits A) while others are indirect (A benefits B who benefits C who benefits A; for example, a teacher prepares lessons for students and is paid by the school system). Other tasks may require contributions by several actors whose efforts are combined into a product that is a shared benefit for all. Each of these variations may make comparisons of inputs, of outcomes, or of ratio of inputs to outcomes difficult and also may affect judgments of how fair a situation is (Molm and Cook, 1995).

We can also note that there is not always a straight forward relationship between relative contribution and relative reward. Such cases often arise in complex task situations. For example, many interactions are indirect exchanges, meaning they have outcomes distributed by others than the contributors (as when members of a work group complete a project and are paid by their supervisor). Also, different kinds of tasks, having different ways of combining individual actions, may make it difficult to tell who contributed more or conversely have successful task achievement depend most on one person (when one person knows how to use the microwave, everyone can eat dinner). Situations of division of labor (I fill the dishwasher every day, you empty the trash once a week) may also make it hard to assess relative inputs but have strong norms about fairness of distribution of both inputs and outcomes.

As general assumptions we will suppose that 1) the more complex or distant the relationship between inputs and experienced outcomes (e.g., indirect vs direct exchange), the stronger will be the effect of independent standards for contributive fairness; 2) the more discretion actors have over their contributions (e.g., reciprocal vs negotiated exchange), the stronger the effect of independent standards for contributive fairness and 3) the more similar individuals' contributions are to each other and the more easily they are counted, (e.g. not the case when the task, or social role expectations, demand a division of labor) the more effect contributive standards will have.

*Contributive justice and other legitimacy theories: distributive justice***.** The concept of "distributive justice" is parallel to the concept of contributive justice. Distributive justice refers to evaluations of the *outcomes* received by participants in a social interaction. This has been extensively

explored by social psychologists (for a few examples, see: Hegtvedt & Markovsky, 1995; Bierhoff, et al, 1986; Cook & Hegtvedt, 1983; Homans, 1974; Greenberg & Cohen, 1982; Hegtvedt, 2005; Walster et al, 1978; Markovsky, 1985). A typical definition is that "justice exists when there is congruence between expectations for outcomes based on [a] normative rule and actual outcomes" (Hegtvedt & Markovsky 1995, p. 259). Perception that justice exists leads to satisfaction while perception that it does not leads to negative emotions and actions to change or else to avoid future interactions. Similarly, contributive justice is here defined as existing when there is congruence between expectation for *inputs* (also based on a normative rule) and actual inputs. Likewise, perception that congruence exists leads to satisfaction while perception that it does not leads to negative emotions and actions to change or avoid future interactions.

Legitimacy theories, Justice standards and normative rules: equity. To say that there is a 'normative rule' means that there exists in the minds of the participants a standard that can be used to compare with actual outcomes or inputs. Further, they believe they share this standard with other participants .One standard invoked by theories of distributive justice is 'equity', which requires three comparisons; first, for each individual, the value of inputs given by that person to inputs of others; second, for each individual, comparison of outcomes received by that person to outcomes received by others, and third, comparison across individuals of the ratios of inputs to outcomes (Adams 1965, Homans 1974, Walster et al. 1978). Equity exists when each person's outcome relative to others is proportional to that person's inputs relative to others. More informally, those who contribute more should receive more. A distribution will be seen as "fair" when requirements for equity are met. We can note that this traditional definition of 'equity' requires assuming that actors pay attention to their own and others' inputs; from Adams on, social psychologists of equity have been assuming that people count, compare and evaluate their own and others' inputs. It is thus consistent with equity theory to suppose that there exist normative standards for what is 'fair' for inputs as well as at the more complex situation of assessing inputs relative to outcomes.

Legitimacy theories, justice standards and normative rules: Equality vs. equality. Another variant of distributive justice theory examines the possibility that 'equity' is not the only type of comparison

standard; for example, ‘equality’ may be invoked as a standard. Here, actors feel the situation is fair when all have equal outcomes regardless of whether they have differently valued inputs or characteristics (Deutsch, 1975). In fact, these theorists argue, the invidious comparisons required to assess equity may create problems of resentment and interfere with the ability of the group members to work together. Some research suggests that actors seek to work out a compromise among equality, equity and other standards such as need (e.g., Elliott and Meeker, 1984, 1986; Meeker and Elliott, 1996, 1998). We assume that in assessing contributions also, some situations have normative standards that call for equality while others may call for inequality. Since the term ‘equity’ generally refers to outcomes, we need a different term; here we will refer to “obligatory inequality” for normative standards for inputs that call for unequal inputs. We also assume another possible standard the ‘Minimum/maximum” which specifies either the most or the least level of contribution that is acceptable.

Legitimacy theories: *normative rules.* What constitutes a ‘normative standard’? Theoretically, a normative standard is a type of template to which existing circumstances can be compared. Normative standards are based on legitimacy, the perception that this standard is shared by others. According to Walker & Zelditch (1993) and Zelditch (2001), legitimacy may stem from perception that higher levels in a hierarchy endorse and will enforce a standard, or from a perception that peers endorse and will try to enforce a standard (or both). Research in this tradition demonstrates that even in the absence of personal approval, individuals will support a ‘just’ and fail to support an ‘unjust’ reward structure when they perceive that others support or fail to support it (e.g., Johnson et al, 2016).

C*omparison to what? Status value normative standards*. While agreeing that failure of congruence between expectations and outcomes produces negative emotions and behaviors, other theorists suggest that equity based on a local comparison of ratio of inputs to outcomes is not the only source of the normative standard for distributive justice. Along these lines, Berger et al. (1972) have introduced a *status value* theory of distributive justice. According to this approach, people enter an interaction with prior conceptions of the value of their and others’ social characteristics, which provide a referential standard for assessing whether self and other “get what people like us in general receive”

(Hegtvedt & Markovsky, 1995, p 268). There may be several layers or levels of standards for assessing whether a particular ratio of inputs to outcomes across a set of actors is 'fair' (Markovsky, 1985; Tornblom, 1977; Clay-Warner et al 2016). For contributive justice, we also assume that status value (what "people like us ought to contribute") may provide the normative standard for evaluating inputs and that there may be multiple layers of potential comparisons.

Justice rules: Comparisons to others in the same interaction? Some psychologists think that not all social interactions involve any comparisons of inputs or outcomes. Clark and Mills, (1979; 2012) distinguish between *exchange-oriented relationships*, in which participants do expect reciprocity of benefits and *communal-oriented relationships*, in which one person provides benefits to another without expectation of return. In a communal relationship no account is kept of how often or how much one person has benefitted another; actions are governed more by mutual attraction and commitment to the good of the other person and to the relationship. Our definition of contributive justice allows for the possibility that direct comparison with immediate others may not be part of the standard; however, we assume that even in such settings there is some standard. As mentioned above, status value is one such external standard. Another is an idea of a minimum contribution required to maintain belonging to a group, and a maximum..

*Normative rules: Procedural Justice***.** Considerable evidence has accumulated that people evaluate a situation involving comparison of outcomes as 'fair' when the procedures used to make a distribution conform to legitimate standards (Lind & Tyler, 1988; Molm, et al 2003). This type of normative standard for assessing fairness is called 'procedural justice'. Distributions that violate standards of equity or equality may be perceived as 'fair' (although unfortunate) if the procedures that produced them are considered just. Likewise, in developing a theory of contributive justice we can suppose that levels of inputs assigned by just or fair procedures may be considered 'fair'.

Contributive Justice and control or balance theories. The third general category of theory from which ideas about contributive justice can be drawn is control or balance theory. Examples of control or balance theories that have been well developed in sociology include affect control, identity control and

cognitive balance (see for example the volume edited by McClelland and Fararo, 2006). A control or balance theory posits a template of what should happen against which actors compare their perceptions of what has actually happened. When there is congruence, actors are satisfied with the situation and when there is not they experience distress and act to either to change the situation or to revise their template. Control theories are systems theories; they argue the operation of feedback mechanisms, and predict the emergence of an equilibrium that does not change from moment to moment unless disturbed by outside influences.

Evidence for standards for inputs

Is there evidence that contributive justice standards exist independently of other justice standards? Considering the enormous literature on *distributive* justice, it is somewhat surprising that there has been so little explicit attention to where expectations for level of *inputs* come from. However, an examination of research in group processes over the years shows implicit attention to normative standards for inputs. Some theorists (e.g., Blau, 1964) have explicitly tied level of inputs to expectations for outcomes, suggesting for example that an individual may seek to manipulate another by providing valued contributions, thereby putting the other 'in debt' and into a situation requiring either reciprocity or acceptance of a power imbalance. Also, in an early influential article Gouldner (1960) proposed that all social interaction is supported by a general norm of reciprocity, meaning that people provide benefits to others because they expect eventually to receive some benefit in return.

There certainly is anecdotal evidence. For example, in one of the earliest analyses of group processes, Homans (1950) noted that in the "Bank Wiring Observation Room" a group of skilled manual workers enforced a standard of maximum permitted contribution, which for some limited productivity. While agreeing that it was 'fair' for a worker who produced more to get paid more, they also agreed that it was possibly dangerous for the rest of the workers to have some obviously out-producing others, so as a group they agreed on and enforced a standard of 'a fair days work', the same for all . Norms of restriction of production appear in a variety of organizational settings, including classrooms that are graded on a curve.

In another example from early group process research, Bales and colleagues (1951) noted that in a number of the discussion groups they studied there was substantial resentment of an 'overactive' (i.e., over-talkative) group member. In the absence of any legitimate reason for assuming leadership, highly unequal contributions were seen as inappropriate. .We find other examples from group process research on problems of social dilemmas, also known as collective action situations, (e.g., Yamagishi, 1995) The dilemma in such situations is that some people can benefit without contributing, if enough others do contribute (public goods such as a neighborhood park, a worker's union, or Public Broadcasting are examples).In these situations, there is a disconnect between inputs and outcomes- a good is created by action of a few that benefits many. Contributors to a group product in a collective action situation disapprove of 'free riders' (people who benefit without making contributions, even when their contributions are not necessary to achieve the group benefit). In our current terminology, there seems to be a 'minimum' contributive justice standard.

Another area in which standards for contributions have been extensively explored is the allocation of tasks within a household (housework, child care, income, extended family obligations, etc). Some households endorse equality, others a division of labor (usually with standards derived from societal standards about gender roles), contributions based on individual preferences and abilities, or some minimum required for survival (if the rent is not paid, the household will be evicted; if the children are not fed, they may be taken away by social services). Most researchers agree that households either have or debate such standards and that these issues are cause of a sense of fairness and satisfaction or the opposite (e.g., Bianchi et al, 2000; Rupener, 2008, Treas and Drobnic, 2010).

Status generalization as a source of contributive justice standards. An important research program in sociological social psychology over several decades is "status generalization" (Berger et al, 1972, Ridgeway 2014). Status generalization can be seen as one of the ways of looking at normative standards for contributions. This research program has shown that in collectively oriented group settings (that is, where a successful group task outcome benefits all group members regardless of amount of contribution) contributions by actors who are thought to be more competent are more likely to be

expected and solicited. It is legitimate to allow them more influence in the group decision making process. Even when no external status distinctions exist, however, inequalities in rate of talking usually appear in unstructured discussion groups; as with the "overactive deviants" these inequalities in participation may be defined as illegitimate. However, status generalization processes may lead to legitimate standards of obligatory or at least acceptable inequality.

How to count contributions and distributions? There may be difficulties with simple calculations of both equity and equality in either contributions or rewards. People may find such comparisons inadequate when individuals differ in the cost they incur for a given input; for example, the same measurable about of contribution to a group project may be seen as more deserving if it has involved greater effort (for example, Elliott and Meeker, 1984) or inappropriate when contributions from some individuals are seen as self-motivated rather than directed to the group benefit. (e.g., Ridgeway, 1982). Some "contributions" may incur costs to a group as well as benefits (Meeker and Elliott, 1987).

Contributive and distributive standards may be in fact be contradictory; for example, it may be expected that all contribute to a group project equally but if that unequal contributions occur, higher contributors should get higher rewards, or conversely that participants in a group project should contribute as much as they can with differences in ability resulting in legitimate differences in contributions but that all share equally in rewards. Sometimes being allowed to contribute may be defined as one of the rewards the group has to distribute (being a 'leader' presumably contributing to self-esteem). Also, since at least a minimum contribution can be required of even low status members, groups have ways of rewarding these minimum contributions, for example by treating them as "respectable because reasonable" (Ridgeway and Nakagawa, 2017).

To return to the main point: the theory of contributive justice states that, given a situation with two or more actors, in an interdependent setting, over a period of time in which there are repeated actions, there will be a normative standard for contributions, that is, for how much one person does for others. As with other normative standards, failure of congruence is hypothesized to lead to negative emotions and actions to change. However, contributive justice is only one among many possible sources of actual

contributions; such factors as distributive justice standards, individual predispositions and abilities, the nature of the task and how actions are combined, how visible each person's contributions are to others, status, norms associated with different social roles, and network power imbalances can all affect contributions. It is apparent that contributive standards must be closely related to the nature of the task(s) the group is working on; some tasks have very specific demands for timing, coordination, division of labor or decision making and these affect the amount and timing of contributions.

Inputs in task oriented discussion groups.

We now turn to a particular type of task group, discussion groups. Discussion groups are important, because many tasks are carried out by discussion groups (e.g., committees, juries, work teams, councils). They have also been extensively studied by social psychologists. The most basic and easily observable measure of contribution to a discussion group is the amount of talking by each member. There exists a large literature going back more than half a century using various indicators of amount of talking in discussion groups beginning with R. F. Bales and associates (Bales et al, 1950). A number of techniques for counting speech acts exist, including number of separately identifiable remarks, total amount of time, and number of interruptions per individual. Most of the research has emphasized the emergence and maintenance of inequality; why and how do some people talk more than others (an excellent review can be found in Skvoretz and Fararo, 2016),

Several demands of their task affect the amount of talking by members of discussion groups. One crucial demand is that discussion requires that members take turns. Although their orientation is cooperative, there also exists a competition for the use of the scarce resource of time. Participants in a group discussion often have strong feelings about whether a person has talked too much, or not enough. Discussion groups also often adopt formal procedures for allocating talking time such as Roberts's Rules of Order or, as in the U.S. Supreme Court deliberations, the rule that no one speaks a second time until everyone has spoken once.

In the rest of this paper I develop a set of formal models for the distribution of interaction in discussion groups that introduce a standard of contributive justice as one theoretical factor affecting the

amount individuals talk in discussion group settings. Predictions from these models are then compared with data from a laboratory study of real discussion groups. We shall see that although contributive standard alone does not predict distribution of interaction well, its inclusion along with other factors does.

Application: computer simulations of the amount of talking in a task-oriented discussion group

In this section a computer simulation model is developed that predicts the number of speech acts by each person in each minute in a 4-person discussion group. On the first minute, some talk more than others: there are 60 minutes of talking. I construct 4 models: a baseline; one with a contributive standard only; one that assumes a deference hierarchy plus individual differences and recognition that talking time is scarce in a discussion group but assumes no contributive standard; and 4 cases of a model combining these with contributive standard. These models' predictions are then compared with data from a study of real discussion groups.

Model 1. Baseline Model. A baseline model for amount of talking in a discussion group assumes only that there are stable individual differences in rate of talking, that is, each member has an inherent rate of talking, observable in the first minute of the discussion and constant thereafter. Each minute of discussion replicates the previous minute. An equation for this is:

$$x_{i,t} = x_{i,t-1} \qquad \text{Eq. 1.0}$$

where x_i is the number of acts by person i in minute t and $x_{i,,t-1}$ is the number of acts by person i in minute t-1 (the previous minute).

In assessing the results of the models presented here, three features of results will be examined: the shape of the process over time, the predicted number of acts by the whole group on the last five minutes, and the predicted percent of acts by the most talkative actor on the last five minutes. For the baseline model, the predicted shape is flat, (See Figure 1) the predicted group total on the last minute:

14.0, and the predicted percent by top actor: 36%.

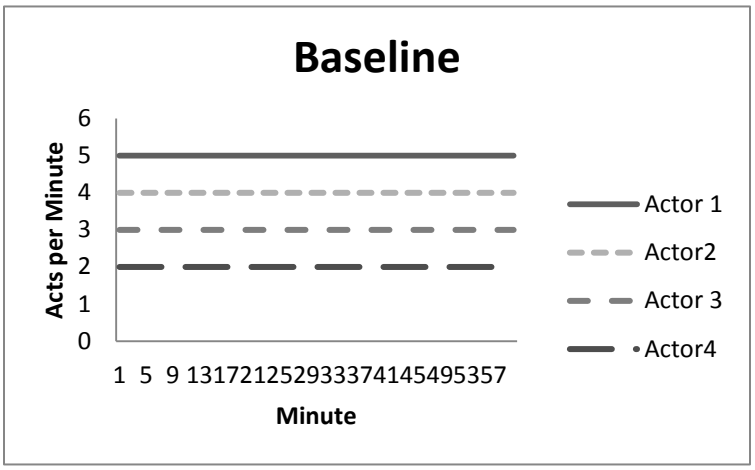


Figure 1. Model 1. Baseline model:
total on last minute: 14.0. Predicted % top actor: 36%

Model 2. Contributive justice: equal, and unequal.

The second theoretical model assumes that group members begin with unequal rate of talking as in Model 1 but that the amount each talks on each subsequent minute is governed both by repeating the amount talked in the previous minute (as in the Baseline model) but also by a 'balance' process in which each actor compares his/her rate of talking over all previous minutes with an ideal rate. The actor then either increases or decreases his/her rate of talking, talking more if the accumulated past rate is below the ideal and less if that rate is above. This requires a pair of parameters:

- Φ_i, the ideal 'fair share' for actor i and
- $a_{i,t}$, i's actual share of output for all the previous minutes.

$$a_{i,t} = \sum_{t=1}^{m-1} x_{i,t} / \sum_{i=1}^{4} \sum_{t=1}^{m-1} x_{i,t} \qquad \text{Eq. 2.1}$$

Where m-1 is the number of minutes up to the present one and $a_{i,t}$ is actor i's share. This share is the total number of acts produced by person i over all minutes up to the present divided by the total number of acts produced by all actors. The model then compares $a_{i.t,}$ i's actual share, with Φ_i, i's ideal share, and introduces this into the equations for the four-person model.

$$x_{1,t} = x_{1,t-1} * (\Phi_1 / a_{1,t-1}) \qquad \text{Eq. 2.2}$$

Note that if i's share is greater than ideal, $a_{i,t-1}$,> Φ_i, and $\Phi_i / a_{i,t-1} < 1$ so actor i's output is reduced for minute t, while if i's share is less than ideal, $a_{I,t-1} < \Phi_i$, and $\Phi_i / a_{i,t-1} > 1$ so actor i's output is increased for minute t.

The results of Model 2 assuming the standard is equality is shown in Figures 2.a and 2.b, while assuming it is unequal in 3.a and 3.b.

Figure 2. Model 2. Contributive justice standard only, equal

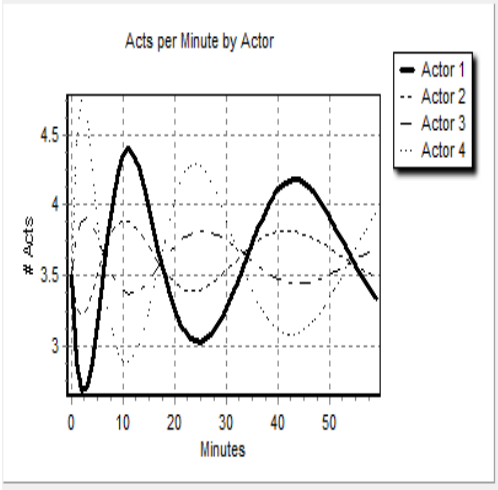


Figure 2.a individual acts per minute

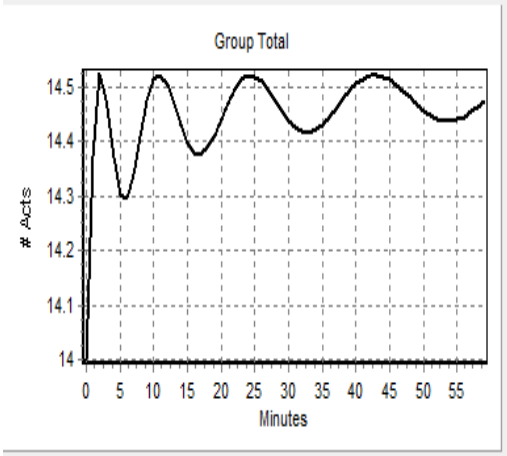


Figure 2.b group total number of acts per minute

Figure 2.a and 2.b. Group average on last 5 minutes: 14.45: Top actor on last 5 minutes : 24%

Figure 3. Model 2, Contributive standard only, unequal (standard for each actor = 35%, 25%, 22%, 18%)

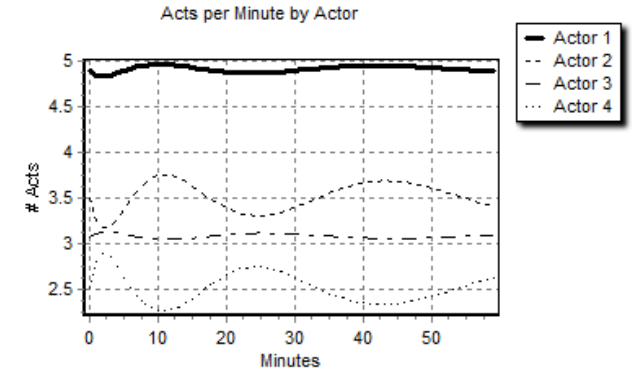


Fig. 3.a Model 2 Contributive standard only, unequal (35%, 25%, 22%, 18%) number of acts per minute by actor

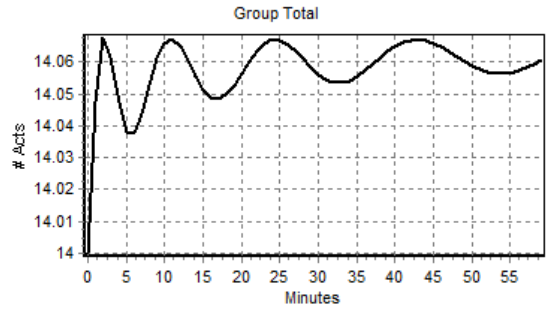


Fig. 3.b. Model 2. Contributive standard only unequal (35%, 25%, 22%, 18%) group total per minute

Fig 3.a and 3.b, Group average on last 5 minutes: 14.06: Top actor on last 5 minutes : 35%

With Model 2, seen in Figures 2 and 3, the amount of talking fluctuates over time. In Figure 2.a the group average at the end is 14.45 (close to the average at the beginning) and in Figure 2.b the percent contributed by the top actor is 24%, close to the 'ideal' of equality. Figure 3.a and 3.b show results with a contributive standard of inequality; the top actor assumes he/she should contribute 35%, the second 25%, the third 22% and the least 18%. Once again the group total oscillates but ends very close to the rate at the beginning, while in this case the percent for the top actor closely replicates the ideal rate of 35%. In summary, in both models using a contributive standard only, the individual rates approach the 'ideal', while the process continues to oscillate.

Model 3. Other influences on rate of talking: time scarcity, individual differences and deference

Constraints on Inputs in a discussion group. Human discussion requires an alternation of roles between speaking and listening, which imposes constraints on individual behavior. When one person talks, others must listen but if it is to be a discussion (and not a lecture) an individual who has been talking must cease at some point. Although all members must talk, they seldom talk the same amount when the number of speech acts is counted. Small and otherwise unstructured discussion groups develop structures in which the amount an individual talks, that individual's influence on group action and the respect that individual receives from others, are correlated (Bales, 1952; Bales et al, 1951). Even in groups that are composed of status equals who are not previously known to each other. the person who talks the most tends to receive the most respect, interrupts others more and is interrupted by others less, and (usually) has more influence on the group outcome than others. This structure has been attributed to a 'deference hierarchy' (for a review of the extensive literature on deference hierarchies, see Skvoretz and Fararo, 2016). According to a deference hierarchy model, members of a group develop a normative standard for who should speak first; group members agree to wait until the person ahead of them in a deference hierarchy either stops speaking or declines to speak. The model presented here incorporates this process.

What leads one person to be ahead of another in a deference hierarchy? One factor is a stable

trait of individuals, the speed with which a person begins to speak and amount of talking once started; some people are more talkative than others. This can be modified by the social setting; extremely talkative people may in some settings be very silent. A combination of a stable personality trait and features of the social setting produce an individual propensity to talk in a particular group situation. For the model presented here, it is assumed that in an otherwise unstructured small group (one in which there are no observable outside differences between members such as status characteristics like gender, age, race, or other ranked attributes) a deference hierarchy will develop based on individual differences in talkativeness. The group will assume that those who seem willing to talk first are legitimately to be allowed to do so. However, in a group with an externally defined status structure status generalization research (Berger et al, 1972, Ridgeway 2014) shows that differences in rank on external status characteristics such as gender, ethnicity, social class or formal position within an organization will, unless explicitly contradicted within the group, create a hierarchy of expected competence and hence an underlying rank order that will affect the observed amount of talking. This process shows how external status differences, even when actually unrelated to task competence, can assign position in a deference hierarchy through their effect on task performance expectations. [2]

What standard of contributive justice should we assume for task oriented discussion groups? In an otherwise unstructured group with a collective and task orientation, the outcome is determined by combination of efforts and rewards are distributed equally. According to the theoretical reasoning above, this there should be a contributive standard of equality. When external status difference do exist, we assume that the standard for contributive justice will follow the status differences; it will seem 'fair' for higher status individuals to talk more than 25% of the time.

This model assumes, as in the baseline, that each minute partially replicates the previous; the amount each actor talks is the same as the amount he/she talked the minute before but modified by parameters representing a contributive standard, scarcity of time, and individual propensity to talk.

[2] What if the highest ranked person is not the inherently most talkative? This possibility is examined briefly below. There are a number of ways in which these processes may appear to work at cross purposes; the model proposed here enables us to examine the effects of some of these contradictions.

The equations in this model are based on work by Leik and Meeker (Leik & Meeker (1995), Meeker & Leik (1997) and Meeker (2002). These are in turn based on a set of models familiar in biology (Lotka, 1932; Volterra, 1931).

Group discussion requires turn-taking: talking in *previous* minute reduces time for self in this minute; add a parameter S_i, representing the degree to which actor i's talking on one minute is reduced by his/her own talking the minute before.[3]

$$x_{1,t} = x_{1,t-1} + x_{1,t-1}(- S_1 * x_{1,t-1}) \qquad \text{Eq. 3.1}$$

Time is scarce: talking in *this* minute reduces time for others in this minute; add a parameter R_i, representing the degree to which actor i's talking is reduced by others' talking in the current minute.

$$x_{2,t} = x_{2,t-1} + x_{2,t-1}(- R_2 * x_{1,t} - S_2 * x_{2,t-1},) \qquad \text{Eq. 3.2}$$

People differ: each has a different rate of talking; add parameter C_i, representing actor i's inherent rate of talkativeness.

$$x_{2,t} = x_{2,t-1} + x_{2,t-1}(- R_2 * x_{1,t} - S_2 * x_{2,t-1} + C_2) \qquad \text{Eq. 3.3}$$

Deference order: going first gives an advantage

$$x_{1,t} = x_{1,t-1} + x_{1,t-1} (- S_1 * x_{1,t-1} + C_1) \qquad \text{Eq. 4.1}$$

$$x_{2,t} = x_{2,t-1} + x_{2,t-1} (- R_2 * x_{1,t} - S_2 * x_{2,t-1} + C_2) \qquad \text{Eq. 4.2}$$

$$x_{3,t} = x_{3,t-1} + x_{3,t-1} (- R_3 * (x_{1,t} + x_{2,t}) - S_3 * x_{3,t-1} + C_3) \qquad \text{Eq. 4.3}$$

$$x_{4,t} = x_{4,t-1} + x_{4,t-1} (- R_4 * (x_{1,t} + x_{2,t} + x_{3,t}) - S_4 * x_{4,t-1} + C_4) \qquad \text{Eq. 4.4}$$

Here $x_{i,t}$ is the number of speech acts produced by actor i in minute t; R_i is the value of the parameter R for actor i, S_i is the value of the parameter S for actor i and C_i is the value of the parameter C for actor i, all constants. The assumption that there is a deference hierarchy is met by assuming that within each minute, the highest rank actor will be allowed to speak first, while each successive rank actor will fill in time left open by the higher rank actors. Thus, the equation for every actor contains the amount of talking in *that* minute by each actor *higher* in rank.

[3] Eq. 3.1 and following are examples of the logistic curve, familiar to demographers and epidemiologists because it can describe the growth of populations and epidemics. The basic logistic curve is also a well known example of a process that can, with some parameters, become chaotic.

Predictions made by model 3 are shown in Figure 4.

Figure 4.
Model 3. time scarcity, individual differences and deference.
No Contributive Standard
Parameters: R=.05, S = .07; C1=.4, C2=.3, C3=.25, C4=.2

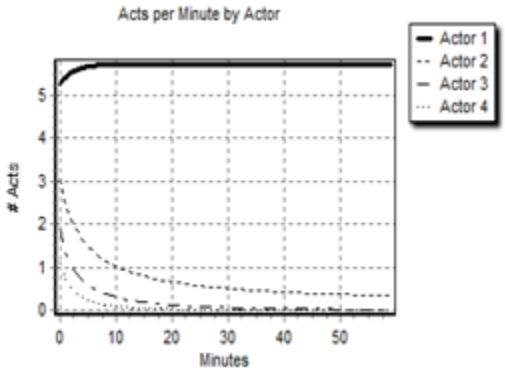


Fig 4.a. acts per minute by actor,
no contributive standard

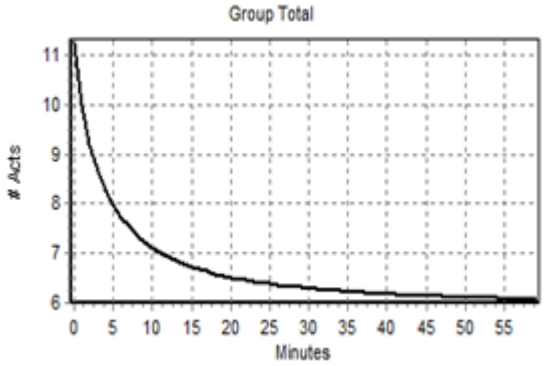


Fig 4.b Group total by minute,
no contributive standard

Group average last 5 minutes: 6.06
Top actor last 5 minutes: 94%
Note actors #3 and #4 have 0% at end.

Comparison with some real groups.

We now ask how well any of these models describe actual amount of talking in real groups. These data were collected by a team directed by John Skvoretz, Murray Webster and Joseph Whitmeyer, as part of a research program designed to develop stochastic models of status generalization in small groups (Skvoretz, Webster & Whitmeyer, 1999; Skvoretz & Fararo, 1996, 2016). The data are from four-person groups, composed of university undergraduates at a southern state university, who were recruited through campus advertisements to be in a study for pay. All groups were same-sex, and participants were previously unacquainted. The groups' task was a 'survival' problem: to rank order 15 items (e.g., water, a flashlight, a Geiger counter) according to usefulness in a fallout shelter in the event of nuclear attack. The groups were asked to talk until they reached consensus and were informed that their decisions would be evaluated by their reasoning as well as how nearly their answers resembled expert opinions.In the analysis that follows, the *unit of analysis* is the group; 50 groups are included.

Dependent variables: talking. The dependent variables are derived from observations of the verbal activity (talking) of the participants. All verbal activity was measured electronically. The experimenters equipped each group member with a voice-activated recorder, which was attached to a computer system that registered when the person began and finished talking, in fractions of a second. This resulted in a file of 'acts' each with a time stamp indicating which person produced the act and the fraction of a second from start of the group discussion the act began and ended. An 'act' was defined by the researchers as a continuous speech, 'continuous' meaning there is no more than a 1.5 second pause between speeches by the same person. Acts less than 0.33 seconds were removed from the file to eliminate accidental, non-meaningful noises. The acts as counted in the data file include every time an actor talks, whether or not someone else is also talking at that moment. For purposes of the present project, the data file provided by Skvoretz et al was transformed into a file of minutes by actors, which consists of the number of acts produced by each actor in each minute.

Initial analysis showed that gender is not significantly associated with any other variables; male and female groups are therefore combined in further analysis. The discussions ranged from 27 minutes to 47 minutes (for all 50 groups combined, mean length= 34.2 minutes, with standard deviation=6.73). Since groups vary in the number of minutes of discussion, the analysis here is limited to the first 27 minutes of discussion. No correlation was found between total number of minutes of discussion and any of the other variables considered here.

Variables. Independent Variable: Status. The experiment had three conditions of external status operationalized by both class standing (1st year vs. 4th year students) and an additional manipulation that informed subjects in groups with both 1st and 4th year students that the 4th year students had superior academic records. Subjects were randomly assigned to same-sex groups in one of the following status conditions:

Equal (groups composed of four 1st year students)	n=16 groups
2 High, 2 Low (groups with two 1st year and two 4th year students)	n=17 groups
1 High, 3 Low (groups with one 4th year and three 1st year students)	n=17 groups

Examination of results from the two unequal conditions, 2High, 2Low and 1 High, 3 Low, showed that there were no significant differences between them in the summary variables considered here, nor in patterns over time. Therefore, for purposes of this paper, the two unequal conditions are combined, producing two kinds of groups: Equal (N= 16) and Unequal (N= 34). Figures 5a, b and c show average results for 27 minutes of discussion.

Fig. 5. Comparative data from real groups (from Skvoretz, Webster and Whitmyer)

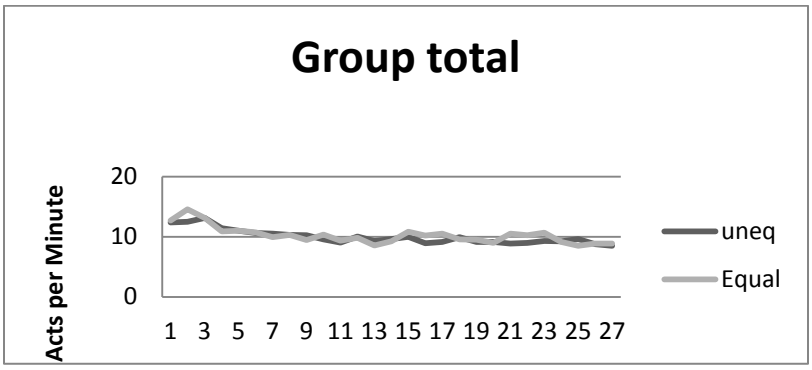


Figure 5a. total acts per minute for Equal and Unequal status groups.
Group average last 5 minutes:
Equal= 8.43, Unequal= 8.92

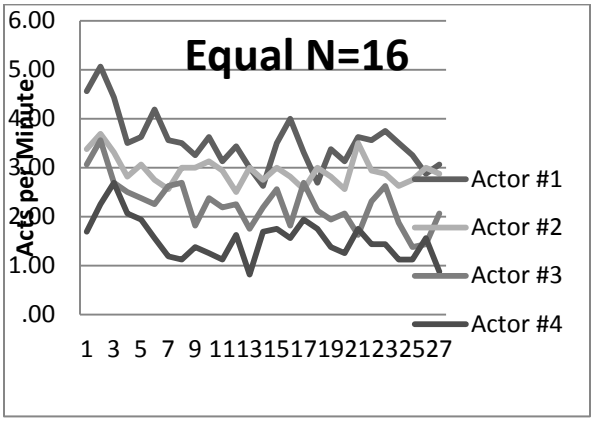


Figure 5b. Average number of acts per minute by Actor, Equal status groups.
% by Top actor in last 5 minutes= 33%

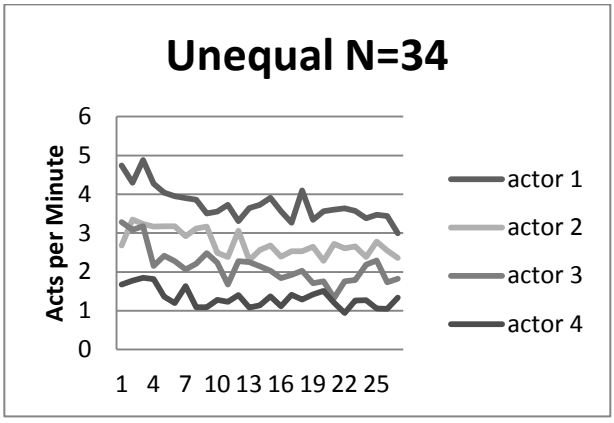


Figure 5c. Average number of acts per minute by actor, Unequal status groups.
% by Top actor in last 5 minute=38%

A striking feature of these results is that the average number of acts per minute declines from a group total of about 14 at the beginning to around 8 or 9 at the end. This is not just an average; examination of all the group profiles (not shown here) shows that out of 50 groups there were only 2 that

did not have fewer acts on minute 27 than on minute 1. Also, as can be seen in Figures 5.b and 5.c, the decline characterizes all 4 actors. The group profiles also show that there are no groups in which any member completely drops out; although there are groups in which there are minutes on which a member says nothing, that member always resumes talking eventually. As should be expected, the average percent for the top actor is somewhat higher in the unequal status groups.

To look like data from these groups, results of simulations of the models should show:

- continuous participation by all actors (no one drops out)

- differentiation- actors differ from each other

- equilibrium- the amount of talking and proportion by each actor stabilizes over time

- decline in group average from about 14 acts per minute at the beginning to around 8 or 9 on the last minute

- inequality- higher percent of acts by top actor in the unequal condition.

None of the models thus examined meet all these criteria. Models 1 and 2 produce inequality but do not show ending at group average of about 8 or 9. Model 3 shows a decline from minute 1 to minute 27 but the least talkative members have dropped out, and the 94% of acts achieved by the top actor is much larger than the 38% in the data.

Model 4. Contributive standard combined with time scarcity, individual difference and deference.

Models 2 and 3 are now combined in model 4. As simplifying assumptions, it is assumed that the fair share expectation is constant throughout the interaction, that each actor has only his/her own share of contributions to worry about and that the individual expectations add up to 100% (each of these simplifying assumptions can be modified in further use of this model, see Appendix).

$$x_{1,t} = x_{1,t-1} * (\Phi_1/a_{1,t-1}) + x_{1,t-1} (- S_1*x_{1,t-1} + C_1) \quad \text{Eq. 5.1}$$

$$x_{2,t} = x_{2,t-1} * (\Phi_2/a_{2,t-1}) + x_{2,t-1}(- R_2 * x_{1,t} - S_2 *x_{2,t-1} + C_2) \quad \text{Eq. 5.2}$$

$$x_{3,t} = x_{3,t-1} * (\Phi_3/a_{3,t-1}) + x_{3,t-1} (- R_3*(x_{1,t} + x_{2,t}) - S_3*x_{3,t-1} + C_3) \quad \text{Eq. 5.3}$$

$$x_{4,t} = x_{4,t-1} * (\Phi_4/a_{4,t-1}) + x_{4,t-1} (- R_4 *(x_{1,t} + x_{2,t} + x_{3,t}) - S_4*x_{4,t-1} + C_4) \quad \text{Eq. 5.4}$$

Results.

A set of results of computer simulations using equations 5.1 - 5.4 and starting at 5, 4, 3, and 2 acts on minute 1 appears in Figures 6 - 8.

Figure 6.
Model 4, Case 1 . Adding contributive standard to Model 3. deference, scarcity of time and individual differences: Initial rate: 5, 4, 3, 2 for all models below

Case 1. Contributive standard: equal
Individual talking rate C: 0.40 0.30 0.25 0.20

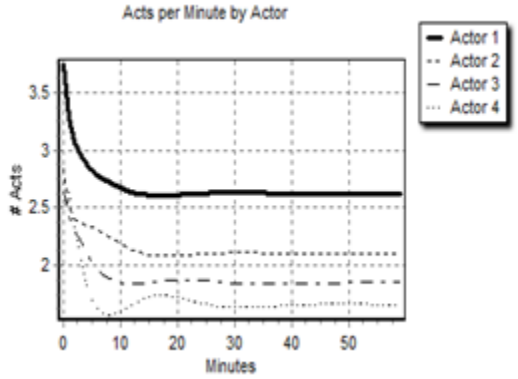


Fig 6.a individual acts per minute

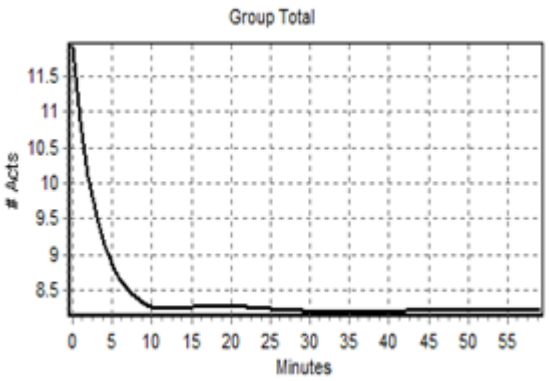
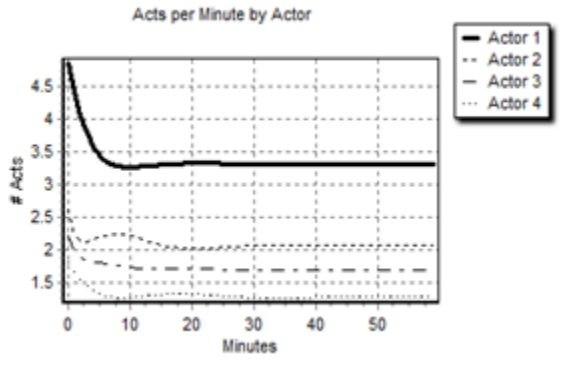


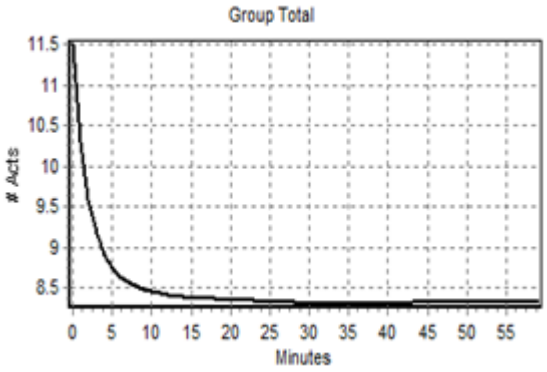
Fig 6.b group total acs per minute

- Group average last 5 minutes: 8.2
- Top actor last 5 minutes: 32%

Figure 7.
Model 4,Case 2

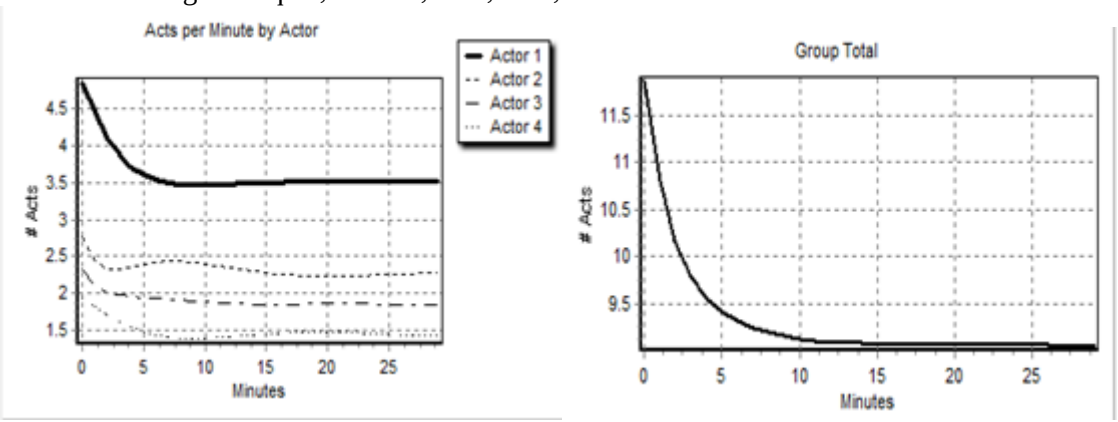
Contributive standard: unequal 35%, 25%, 22%, 18%
Individual talking rate C: 0.40 0.30 0.25 0.20





Group total last minute: 8.33
Top actor last minute: 40%

Figure 8. Model 4, Case 3. Contributive standard: unequal 3%5, 25%, 22%, 18%
Individual talking rate equal, C: 0.35, 0.35, 0.35, 0.35



.

Group average last 5 minutes: 9.05
Top actor last 5 minutes: 39%

Figures 6 and 8 look very much like the real groups: each actor develops a stable rate of talking which is different from each other, and no one drops out. Furthermore, the process declines exactly as in the real data, reaching an average of between 8 and 9 by minute 27. Behind figure 6 is the assumption that the deference order follows the order of talkativeness; that is, actor 1 has the highest value of C, (here .4) actor 2 the next (.3), actor 3 next (.25) and actor 4 is least talkative (.20). In the absence of any external status differences or assigned leadership roles, we suppose group members think it is legitimate to let the most talkative go first. However, we have also assumed that in the absence of status differences, each actor supposes he/she should carry about ¼ of the group burden, i.e. contributive standard is equality. These two processes push against each other early in the discussion but reach equilibrium toward the end. Making the same assumption about deference and the parameter C when there is an external status difference, we assume that actors think the highest status member(s) should talk more, thus a contributive justice standard of inequality. However, since these group members have been randomly assigned to groups, it is likely that some very talkative people have been assigned to a group in which they are low status while some much less talkative people have been assigned to a group in which they have high status. If deference is allocated according to external status when such differences exist prior to

group interaction then is likely that actor 1 may have a low C parameter and actor 4 a high one. Comparing Figures 7 and 8, we see that assuming that (on average) actors have the same C values produces results more like the data. In Figure 7, assuming that the highest status person is also the most inherently talkative and that group members have an unequal contributive standard predicts too much differentiation and too low a total level of talking.

Conclusions.

A simulation model with and without a contributive justice component does not prove that such a component exists in real groups; however, it does show that an otherwise reasonable theoretical model fails without a contributive justice component. In one type of group the contributive justice standard is assumed to be equality, in another, inequality. In the type of discussion group modeled here, the group's discussion has a result that benefits all members equally, a distributive rule of equality. Given equal distribution and the absence of external status differences among group members, both distributive and contributive justice standards should promote equality. However, both the individual differences in talkativeness and the deference process lead to unequal contributions. In other words, several processes are working at cross purposes. The results suggest that the contributive component acts as an equilibrating process, keeping all group members participating and resulting in a stable rate of talking for each member.

This may be an important feature of groups, perhaps helping to explain both why some groups collapse and why others are so stable that they resist changing relative rates of participation even when their task might seem to require it. When one process leads to differentiation in amount of talking and the other to equality, the group is constantly in a state of tension between the two. However, it appears that it is exactly the tension between these two processes that keeps the group together. We have supposed that there are three distinct ways in which individual contributions can be differentiated; by inherent individual difference in talkativeness, by deference processes, and by an unequal contributive justice standard.

Figure 9. Summary: comparing group total and % acts by most talkative actor on last 5 minutes with comparision from real groups.

Model 1Baseline:	Model 2: Equal Contributive standard Only:	Model 3.No Cont Standard
14.0	14.45	6.06
36%	24%	94%

Model 4.

Case 1-:Equal	Case 2- Unequal	Case 3- Unequal cont Standard, Equal talkativeness
8.2	8.3	9.0
32%	40%	39%

Comparison Data

Equal	Unequal
8.4	8.9
33%	38%

Appendix.

The models above have all started with the assumption that actors differ in rate of talking from minute 1 (which is what the real group data show). Both the data and models 3 and 4 then show a decline in over-all rates of talking and this is a feature that we sought in assessing the models.

Figure A1 below shows what happens if we make the same assumption as Model 4, Case 1 except for supposing that all the actors begin with the same relatively low number of acts (here, 2 each). As the results below show, this assumption results in *exactly the same* prediction of group total number of acts and percent by most talkative by the end of 27 minutes as Model 4 Case 1 (Figure 6 above). In this model, *it does not matter how much the actors talk in the first minute*. This is because, as a nonlinear dynamical system with the given parameters, the output reaches a 'fixed point', an equilibrium that will not change unless interrupted from outside the system. From the perspective of a small group researchers, the question to ask is not "why does the rate of talking diminish over time?" but rather "Why are the actors talking so much more than the fixed point at the beginning?"

Figure A1

Model 4, Case1 with the assumption that all actors begin with the same number of acts on minute 1: 2 acts each.

Initial rate: 2,2,2,2 - Contributive standard: equal- C: 0.40 0.30 0.25 0.20.

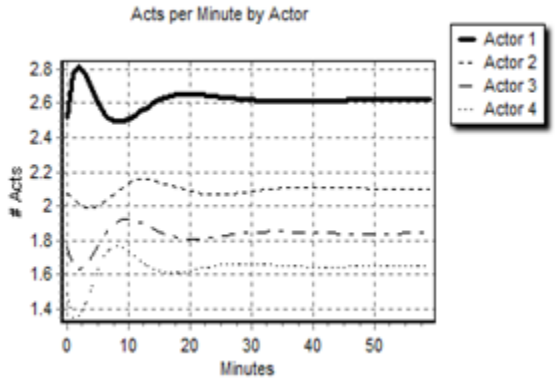


Fig. A1.a individual number of acts Per minute

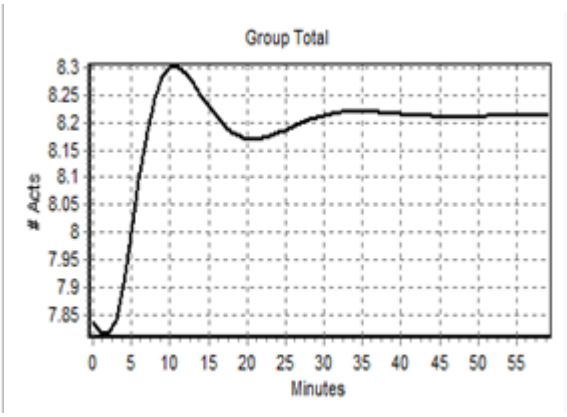


Fig. A1.b group total by minute

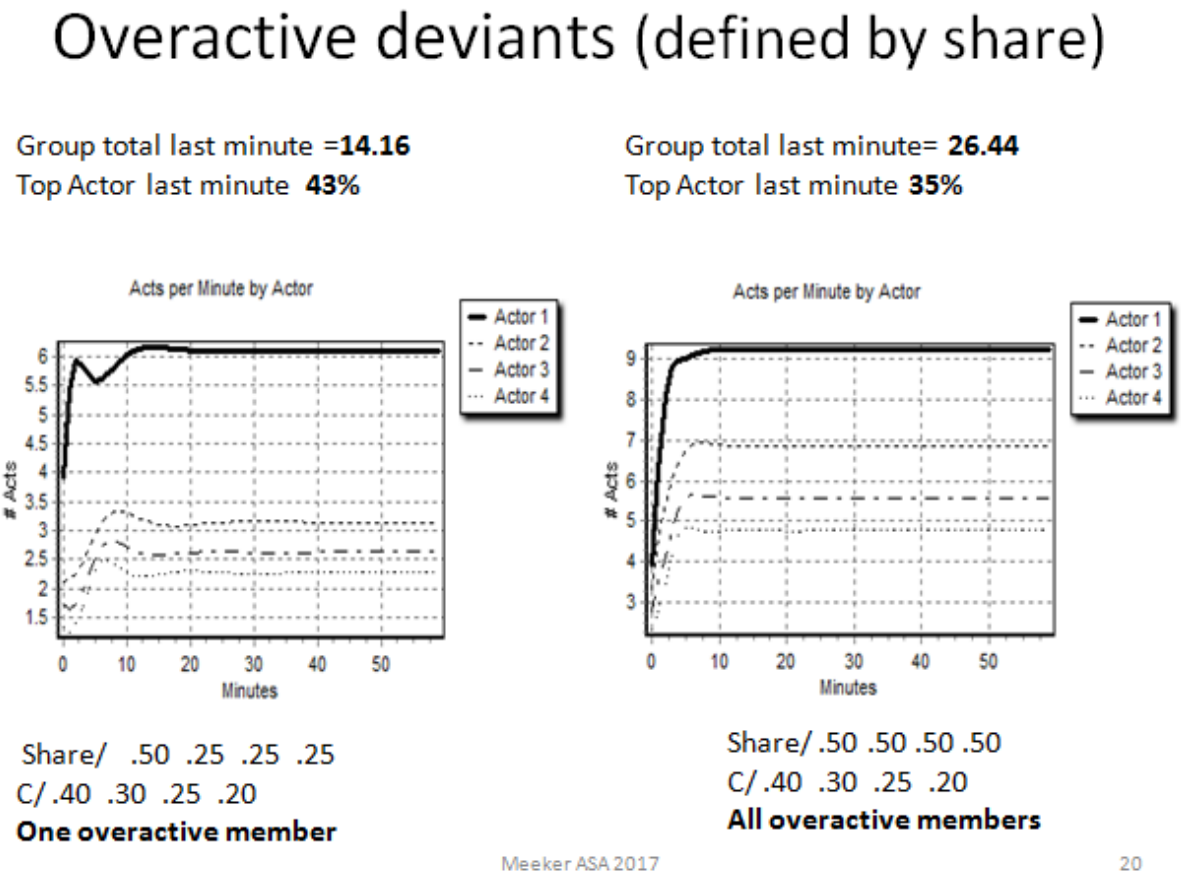
Group total last minute: 8.2

Top actor last minute: 32%

note similarity to Figure 6, Model 4 Case 1

Appendix. Figure A2

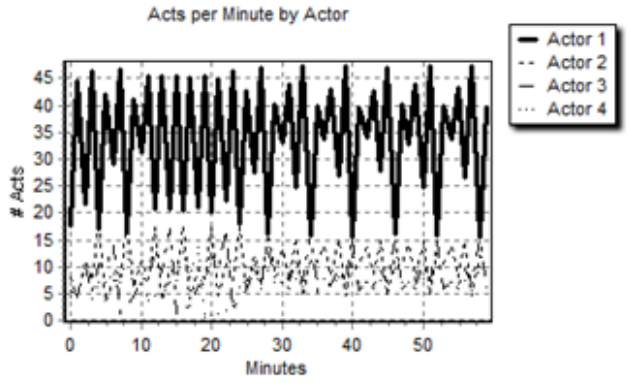
In Figure A2 we address the question of whathappens if the Contributive standards held by the group members add up to more than 100%. (Any one who has ever sat on a committee knows that there may be more than one person who think he/she should talk more than others). The results are that the system can accomomodate rather severe violations of the 'total = 100%' assumption; the very high rate of talking suggest that all members are talking at once.

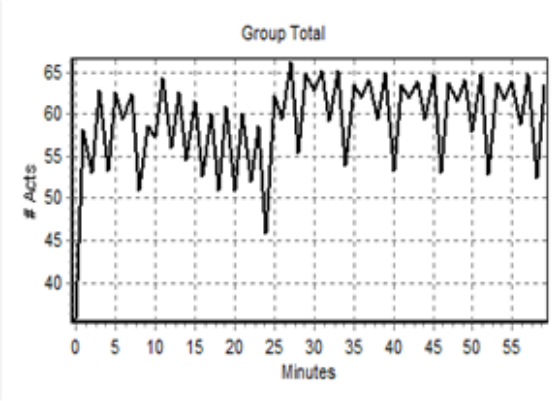


Appendix figure A3.
Here we see what levels of the parameter C result in chaotic output.

More overactive deviants (defined by Individual differences)

- Share/ 0.25 0.25 0.25 0.25 -- C/ 3.20 2.30 2.20 2.10
- Tot/ Pct1/ **63.52 0.62**





note system has become chaotic

REFERENCES

Adams, J.S. 1965. Inequity in social exchange. *Advances in Experimental Social Psychology* 2:267–99.

Bales, R.F. 1950. *Interaction Process Analysis: A Method for the Study of Small Groups*. Cambridge, MA: Addison-Wesley.

Bales, R. F. 1952. The equilibrium problem in small groups. In T. Parsons, R. F. Bales, & E. A. Shils, eds., *Working papers in the theory of action* (pp. 111-161). Glencoe, Ill: The Free Press.

Bales, R. F., Strodtbeck, F. L., Mills, T. M., & Roseborough, M. E., 1951. Channels of communication in small groups. *American Sociological Review, 16,* 461- 468.

Berger, J. Cohen, B. P. & Zelditch, Jr., M. 1972. Status characteristics and social interaction. *American Sociological Review, 37,* 241-255.

Bianchi, S, Milkie, M., Sayer, L. P. and Robinson, J.P. 2000. Is anyone doing the housework? Trends in the gender division of household labor. *Social Forces,* 79:191-228.

Bierhoff, H., Cohen, R.L. & Greenberg J, eds. 1986. *Justice in Social Relations*. New York: Plenum.

Blau, P. M., 1964. *Exchange and Power in Social Life*. NY: Wiley.

Clark, M. S., & Mills, J. 1979. Interpersonal attraction in exchange and communal relationships. *Journal of Personality and Social Psychology, 37,* 12-24.

Clark, M.S., & Mills, J. 2012. Communal (and exchange) relationships. In P. A. M. Van Lange, A. W., Kruglanski & E.T. Higgins, eds., *Handbook of Theories of Social Psychology* (pp. 232-250). Thousand Oaks, CA, Sage.

Clay-Warner, J., Robinson, D. T., Smith-Lovin, L., Rogers, K. B., and James, K. R. 2016. Justice standard determines emotional responses to over-reward. *Social Psychology Quarterly*. 79:44-67.

Cook, K.S. & Hegtvedt, K.A. 1983. Distributive justice, equity, and equality. *Annual Review of Sociology.* 9:217–41

Deutsch, M. 1975. Equity, equality, and need: What determines which value will be used as the basis for distributive justice? *Journal of Social Issues* 31:137–49

Elliott, G. C. & Meeker, B. F. 1984, Modifiers of the equity effect: Group outcome and causes for individual performance. *Journal of Personality and Social Psychology*, 46:586 597.

Elliott, G. C. & Meeker, B. F. 1986. Achieving fairness in the face of competing concerns: the different effects of individual and group characteristics. *Journal of Personality and Social Psychology*, 50:754 760.

Gomberg, P. 2007. *How to Make Opportunity Equal : Race and Contributive Justice.* Malden, MA: Blackwell Pub.

Gouldner, A. W. 1960. The norm of reciprocity. *American Sociological Review*, 25:161-178.

Greenberg, J. & Cohen , R. L.,1982 *Equity and Justice in Social Behavior*, ed., New York: Plenum.

Hegtvedt, K. A. & Markovsky, B. 1995. Justice and injustice. In K.S. Cook, G.A. Fine & J.S., House, eds. *Sociological Perspectives on Social Psychology*. (pp. 257–80) Boston: Allyn Bacon

Hegtvedt, K. A. 2005. Doing justice to the group: Examining the roles of the group in justice research. *Annual Review of Sociolology*.31:25-45.

Homans, G. C., 1950. *The Human Group*. New York: Harcourt Brace.

Homans, G.C. 1974. *Social Behavior: Its Elementary Forms*. New York: Harcourt, Brace and World.

Jasso, G. 1983. Fairness of individual rewards and fairness of the reward distribution: specifying the inconsistency between micro and macro principles of justice. *Social Psychology Quarterly*.46:185–99.

Johnson, C., Hegtvedt, K. A., Khanna, N., and Scheueman, H. L. 2016. Legitimacy processes and emotional responses to injustice. *Social Psychology Quarterly*. 79:95-114.

Leik, R. K. & Meeker, B. F., 1995. Computer simulation for exploring theories: Models of interpersonal cooperation and competition. *Sociological Perspectives, 38*, 463-482.

Lind, E.A. & Tyler, T.R. 1988. *The Social Psychology of Procedural Justice*. New York: Plenum.

Lotka, A. J. 1932. The growth of mixed populations: Two species competing for the common food supply. *Journal of the Washington Academy of Sciences, 21,* 461-469.

Markovsky, B. 1985. Toward a multilevel distributive justice theory. *American Sociological. Review*. 50: 822–39.

McClelland, K. A., and Fararo, T. J. 2006. Purpose, *Meaning and Action: Control Systems Theories in Sociology.* NY: Palgrave-MacMillan.

Meeker, B. F. 2002. Some philosophy of science problems in the development of complex computer simulations. In J. Szmatka, M. J. Lovaglia & K. Wysienska, eds. *The Growth of Social Knowledge: Theory, Simulation, and Empirical Research in Group Processes.* Westport, CT: Praeger. .

Meeker, B. F., and Elliott, G. C. 1987. Counting the costs: equity and the allocation of negative group products. *Social Psychology Quarterly*, 50:7-15.

Meeker, B. F. & Elliott, G. C. 1996. Reward allocations, gender, and task performance. *Social Psychology Quarterly*, 59:294-301

Meeker, B. F. & Elliott, G. C. 1998. Need, merit and reward expectations. *Current Research in Social Psychology*. Vol. 3 No 4:1-12. Http://www.uiowa.edu/~grpproc.

Meeker, B. F. & Leik, R. K. 1997. Computer simulation: An evolving component of theoretical research programs? In J. Szmatka, J. V. Skvoretz & J. Berger eds. *Status, Network and Structure: Theory Construction and Theory Development (p*p. 47-70). Palo Alto, Ca: Stanford University Press.

Molm, L. D. & Cook, K.S. 1995. Social exchange and exchange networks. K. S. Cook, G. A. Fine, & J. S. House, eds. 1995. *Sociological Perspectives on Social Psychology*. (pp. 209–35). Boston: Allyn Bacon.

Molm, L. D., Peterson, G. & Takahashi, N. 2003. In the eye of the beholder: procedural justice in social exchange. *American Sociological Review.* 68:128– 52.

Molm, L.D., Quist, T.M. & Wiseley, P.A., 1993. Reciprocal justice and strategies of exchange. *Social Forces* 72:19–44.

Molm, L.D., Quist, T.M. & Wiseley, P.A., 1994. Imbalanced structures, unfair strategies: power and justice in social exchange. *American Sociological Review* 59:98–121.

Ridgeway, C. 1982. Status in groups: the importance of motivation. *American Sociological Review*. 47: 76-88.

Ridgeway, C. 2014. Why status matters for inequality. *American Sociological Review, 79,* 1-16.

Ridgeway, C. and Nakagawa, S. 2017. Is deference the price of being reasonable? How status hierarchies incentivize acceptance of low status. *Social Psychology Quarterly*. 80:132-152.

Rupener, L. 2008. Fairness and housework.: A cross-national comparison. *Journal of comparative Family Studies*. 39:509-526.

Skvoretz, J., and Fararo, T. J, 1996. Status and participation in task groups. *American Journal of Sociology.* 10:1366-1414.

Skvoretz, J. & Fararo, T. J. 2016. Status and interaction: A stochastic model for the measurement of macro-status value and the determination of micro-status ranking in task group interaction. *Socius: Sociological Research for a Dynamic World*. 2: 1 –16.

Skvoretz, J., Webster, M., and Whitmeyer, J. 1999. Status orders in task groups. *Advances in Group Processes.* 16:199-218.

Tornblom, K. Y. 1977. Distributive justice: typology and propositions. *Human Relations.* 31:1–24.

Treas, J. and Drobnic, S. (eds). 2010. *Dividing the domestic: men, women and household work in cross-national perspective*. Stanford, CA: Stanford University Press.

Volterra, V. 1931. *Leçon sur la theorie mathematique de la lutte pour la vie*. Paris: Gauthier-Villars.

Walker, H. A. & Zelditch Jr., M. 1993. Power, legitimacy, and the stability of authority: a theoretical research program. In J. Berger & M. Zelditch, Jr, Eds *Theoretical Research Programs*. (pp. 364–81). Stanford, CA: Stanford Univ. Press.

Walster E.,Walster, G.W., Berscheid, E. 1978. *Equity:Theory and Research*. Boston: Allyn and Bacon.

Yamagishi, T. 1995. Social dilemmas. in K.S. Cook., G.A. Fine & J.S., House, eds. *Sociological Perspectives on Social Psychology*. (pp. 311- 334). Boston: Allyn Bacon.

Zelditch M., Jr. 2001. Processes of legitimation: recent developments and new directions. *Social Psychology. Quarterly*. 64:4–17.