

Paper for Presentation at the EPCS 2006

Notes on Decision-making Processes in Large Organisations

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March 2006

Abstract

Decision-making processes in large public and private organisations are examined. Since voting is about a given proposal, the preceding process of proposal-creation or -definition - agenda-setting - in a committee is described and analysed by means of the game-theoretic concept of the core. The Shapley value proposes one element of the core, that is regarded as fair and reasonable, since it coincides with the Nash bargaining solution. The Shapley value is furthermore interpreted as yielding relative closeness of the proposal to players' preferences. A probabilistic voting model is presented, that could serve well for committee-compositions described by partial homogeneity.

I. Introduction

In economics the decision making processes of single actors are well explored and described. But when it comes to larger groups of actors, i.e. organisations and entities, we can only resort to social choice theory and models of voting power. These may be sufficient for explaining the composition of decision making bodies via electoral processes - either the

*Earlier versions of this paper have been presented at the Adam Smith Seminar at the University of Hamburg and the EURAS conference 2003 in Aachen. I am indebted to Heide Coenen, Manfred J. Holler, Tobias Langenberg, Martin Leroch, Stefan Napel, and the other participants for valuable insights and fruitful discussions, but the sole responsibility for residual mistakes remains mine.

composition in general or the representatives (persons) the body is composed of - or for explaining decisions about given proposals. But the process of definition of a proposal is not very well explored at all. Either it is supposed that any possible winning coalition is associated with a special outcome, or nothing is stated at all about the given proposal. Nevertheless, in many cases the question what the resulting proposal will be is much more interesting than the actual decision about the proposal itself.

Moreover, even voting power analysis and social choice theory are generally only applied to public, non-profit organisations, mostly national or supranational governmental or non-governmental organisations. The decision-making processes in companies are not very well explored, unless we have to do with a single entrepreneur or one manager in charge, whose decision is not subject to opposition and deliberation. Otherwise rational choices are assumed. But in general, like with public organisations, we can observe decisions evolving in working-groups or committees. These proposals will finally be decided about in, e.g., a board of directors, or in committees of the heads of divisions or departments. But most decisions will at least be prepared by a working-group, a committee or a subcommittee, composed of e.g. experts in the fields concerned. And too often the proposals prepared and adopted are not efficient, implying that they are not shaped by perfectly rational deciders, but by self-centered individuals in negotiations that lead to a resulting compromise with concessions to some parties.

The processes in these committees that lead to and prepare the grounds for (voting) decisions are essentially the same for private and public organisations, although different groups might participate. The proposal of a committee, i.e. a possible solution to the problem at hand, does of course not fall out of the blue, but instead evolves over some unspecified period of time, coined in negotiations by the vested interests of all the persons and groups that take part in its development. Either a sufficient number of members of the committee will

have to be in favour of an already existing proposal, brought forward by one committee member. Or a proposal will be shaped in multilateral negotiations and, more or less, cooperative bargaining. But the process is nevertheless the same for all proposal-definition or -creation processes in committees. Of course the members differ for different organisations.

Therefore it is justified to apply the same framework to (larger) companies and governmental and non-governmental public organisations. At this point an objection might come to mind: the argument, that it is inappropriate to apply the same framework to organisations that produce and provide private goods and to organisations that provide public goods, where the problem of free riding, which ought to be avoided, might occur. But this criticism does not apply here for the following reason.

Generally the decision-making processes within companies are assumed to be of a private good character, since companies produce private goods. But most of these decision-making processes are about public goods, unless they are about sharing the profits. Only a marginal portion of intra-company decisions are about the allocation of profits - i.e. about *dividing the cake* - and thus clearly of a private good character. All other decisions are about increasing (or at least creating) profits - i.e. about *the size of the cake* - and thus of a public good character.² Thus the decision-making processes in private and public organisations are of the same character, although different final goods are provided.

In addition, although these decision-making processes are generally concerned with public goods, the problem of free riding is not relevant here. In proposal-definition in a committee a winning coalition, i.e. a sufficient number of proponents of a proposal, will form for two reasons: first, to 'produce' a proposal, which would allow for free riding. Second, to produce a proposal, that fits the participants' interests. The second reason is the relevant one

²Strictly speaking these are decisions about a club good, since the results of these decisions - generally intra-company standards - are applied to a club: the entire company. On the same token these intra-company standards are applicable only to this club - the company. For simplicity we refrain from outsiders that choose to adopt the same standards, which might yield the problem of differentiating between a club good and a free good.

in this context. If the members of a committee cannot agree upon a proposal up front, this will only be because of the members' vested interests. And because their interests are vested, they will want to realise their favoured proposal out of all possible proposals. To resort to the cake example above, given one possible proposal, i.e. one cake, they will want to increase the size of their piece of the cake - thereby also maximising the size of the cake. This would, partly, correspond to 'producing' a proposal. But, given that more than one acceptable proposal might result from the negotiations, i.e. more than one cake, they will prefer a proposal that is as close to their preferences as possible, i.e. they decide about *the taste of the cake*. For a cake with their preferred taste they might even be willing to accept a smaller size of the cake. This is in both cases a decision about a private good, since personal interests are regarded as more important than overall welfare - a decision about a public good.

Their objective of producing a proposal that fits their needs the committee members can only reach, if they participate in the proposal definition - there is no possibility for free riding in the question of agenda-setting for a public good.³ Although there are costs (of participation or foregone alternatives) involved in this example of agenda-setting for a public good, these costs serve for producing a proposal that fits a participant's needs, i.e. a private good.

For the evaluation of results of the proposal-definition process two different approaches are provided. On one hand the concept of the core is quite to the point and leads, concerning the selection of one out of several possible vectors, straight to the Shapley value as an approximation for fair outcomes. On the other hand a partial homogeneity setting as introduced in Straffin (1977) is proposed, since it should be of special interest to larger companies.

³Although there is of course a small possibility that a proposal could be tailored to exactly their needs due to luck, this is not likely, given vested interests of the participants.

For the analysis of the actual decision that will in the end be made by the voting body itself, could serve, in principle, any power index analysis. But here, in contrast to the argument given above, the public good character of the final decision is important. Since all members of an organisation or the entire company (respectively) have to cope with the decision made, free riding must be avoided for the decision-making process. Therefore possible free riders must not be given power in the sense of the ability to influence the resulting outcome. Of course it is controversial, whether this is true, or whether this decision-making process is also of a private good character. Or whether free riding is possible at all within this context.

Nevertheless another question seems to be more to the point in this context: given that the proposal will be prepared by a committee that is somehow associated and linked with the voting body, will there be any sufficient resistance against accepting the proposal? Generally one would expect that a group within the committee which feels uneasy with the proposal would forestall this proposal. Otherwise, if it is not within the power of this group to forestall the proposal, one would expect that the proponents of the proposal will be sufficiently powerful both in the committee and in the voting body.⁴

Thus the formal power of the voting body might be overestimated and the non-official power of the committee might be underestimated. As an example might serve the European standardization bodies CEN (European Committee for Standardization) and CENELEC (European Committee for Electrotechnical Standardization), who implicitly stated in their internal rules (CEN/CENELEC, 2004), article 6.1.1., that “[i]n all cases where a decision is required, every effort shall be made [by the national representatives] to reach unanimity.” Since in this case the members of the voting body are to vote en bloc, they will try to

⁴We implicitly suppose that the composition of the committee will somehow resemble the composition of the voting body, since it would be irrational for members of the voting body to agree to under representation in the committee.

incorporate their interests already in the proposal to be decided about and provide sufficient support to the committee. Therefore, in addition to the controversiality mentioned, we will neither propose nor provide a general approach to power analysis in these voting bodies and only point to the numerous studies on power in institutions like the EU (e.g. Felsenthal and Machover (2001), Holler and Widgrén (1999), or Leech (2002), just to mention a few). An analysis of the power in CEN, where the decisions are undoubtedly about public goods is provided in Gröndahl (2005).

In the remainder of this paper the unifying framework for larger companies and public organisations for decision-making preparations in a committee is examined in greater detail. This framework is applicable to decisions with many decision-makers in a proposal-definition process in a committee. In section two the agenda-setting framework, where committee-participants serve as resources, is developed. Their influence on the proposal is measured, applying the game-theoretic concept of the core. The Shapley value that coincides for given conflict payoffs with the Nash-bargaining solution, generally accepted as a fair and reasonable solution to bargaining problems, is applied for proposing a fair solution. In the third section the process within the committee is evaluated by means of a probabilistic power index analysis within a partial homogeneity setting, that is applicable for decisions in many big companies. The paper concludes with a summary of the most important results.

II. Agenda-setting

The first question to tackle, which is often much more interesting than the actual decision about a proposal itself, is, what the resulting proposal will be. Since a voting decision in a committee is for or against a proposal, the group that creates the proposal has substantial power concerning the outcome.⁵ The creation of a proposal seems to be the crucial

⁵Their power is of course limited, because if they do not come up with a proposal the voting body finds

part of the decision-making process. As mentioned above, a proposal that is supposed to be decent cannot be composed of different disjointed and incoherent partial proposals. Instead the proposal evolves over some unspecified period of time, coined in negotiations and bargaining between and by all the persons and groups that take part in its development. Whether the body that comes up with a proposal consists of managers of a company, or of (ex-)managers, scientists and politicians in a public committee of a supranational organisation, the proposal is strongly coined by the vested interests of the groups the committee is composed of. For private organisations (companies) these could be e.g. internal and external experts, counselors, and other stakeholders. For public organisations these may be e.g. counselors, affiliates, corresponding organisations, and pressure groups, i.e. representatives of industry and small and medium-sized enterprises, consumers, environmentalists and trade unions.

If there are, e.g. many industry-representatives, the proposal should tend, *ceteris paribus*, to be easily implementable in the production process. If the providers of production technologies are involved, it tends to incorporate state of the art technology. And if some consumer pressure groups take part, the proposal can be expected to tend to care about consumer interests. The proposal thus hinges on the composition of the group of developers of the proposal and on their abilities to contribute and to bargain. This also applies to a proposal for an intra-company decision. Only the composition of the group that develops the proposal will be different. Of course e.g. consumer interests might be taken care of, although supposedly no consumer representative takes part in its development. Such an intra-company decision could for example simply be the decision about a new workflow, which would be a new intra-company standard, or about creating any other intra-company standard, e.g. about

acceptable, they will supposedly be replaced by another group.

the implementation of an industry-wide de-facto or market standard within the company or about developing an own (intra-company) standard.

What the proposal will be depends of course on the composition of the committee and on the decision rule to be applied in the proposal-creation. This decision rule could either be a certain threshold of members of the committee, but more realistic seems to be that consensus of all parties is required. At least only a very low degree of resistance would be expected to be admissible. Usually one would rather expect that some concessions will be made to parties that refuse to agree, as frequently observed in political bargaining.

Thus the proposal that shall be accepted or rejected in a voting game is generally only to a small degree the result of the players' voting weights and some decision rule in the voting body, inasmuch as the composition of the committee will be influenced by the composition of the voting body. Here we have to do with agenda-setting for a final, binary decision and the resulting agenda depends on the interaction of contributions of all (or at least some) players in the agenda-setting committee. The players in this committee could be the same as in the voting body, but generally they tend to be subordinates, colleagues, or other agents of the players that participate in the vote.

As mentioned above, a coalition will form here for two reasons: first, to 'produce' a proposal and second, to produce a proposal, that fits the participants' interests. The first reason implies that we have to view the resulting proposal as a public good, since it will - after acceptance in the decision-making body - be valid for all parties involved, e.g. be a standard for the entire company. But concerning the question of agenda-setting, only the second reason is of importance, since due to their vested interests, the participants will want to realize their favoured proposal out of all possible proposals. This goal can only be reached, if they participate in the proposal definition. Thus there is no possibility for free riding in the question of agenda-setting for a public good. The resources involved in this example for

agenda-setting for a public good serve for producing a private good, i.e. a proposal that fits a player's needs.

With regards to the question of agenda-setting the interesting questions for participants of the agenda-setting process are *what will be the proposal* and *what is my possibility to influence the design of this proposal*. Both questions are already dealt with in Coenen and Gröndahl (2005) concerning alliances, but there the objective is to find out what kind of alliances might form. Here we tackle both questions with regards to intra-organisation and intra-company decision-making, focussing on the final proposal. While in voting games the players' voting weights and the decision rule are the basis for deciding about a player's ability to influence the outcome, here we consider the resources devoted to the proposal-development process and their abilities to shape the resulting proposal in a favourable way. We will therefore evaluate the possible outcomes applying other game theoretic concepts.

Different players, which can be members of pressure groups, organisations, different departments, the board of directors, or, in the extreme case, only the entrepreneur, devote resources to the proposal-defining committee. The committee members will try to incorporate their interests or, e.g., the interests of their group or department in the proposal. If more than one member of a group or department takes part in the agenda-setting body, they will generally all pursue their groups' or departments' interests to a high degree, so that we could simply regard the resources of this group or department as a combination of all resources from this group or department. The result that some given coalition of committee members can reach depends on the resources contributed to the proposal-definition or -formation process. This means that the maximum result can be achieved if all players contribute. If some players do not provide their resources, the result will be suboptimal.

Every participant $i \in N$ of an agenda-setting body of size n will provide an amount of resources, r_i . These resources are generally the human capital (expertise etc.) of either a single player or of his group or department, possibly including his subordinates or a team. These resources are represented by the player in the proposal-definition process. Included in the resources is also the players' bargaining skill, i.e. the ability to convince others and e.g. the timing of the introduction of certain things, which might have a considerable influence on the outcome. The payoff v of the agenda-setting body, i.e. the resulting proposal, depends on these resources:

$$(1) \quad v(N) = v_N(r_1, r_2, \dots, r_{i-1}, r_i, r_{i+1}, \dots, r_n).$$

Typically more resources will lead to a qualitatively better outcome, but the number of players will also have a negative influence on the outcome via increasing costs of communication - it takes longer to reach the outcome and negotiating about the resulting proposal will become more difficult. If k participants of a coalition K pursue a common interest, the payoff of this coalition is given by

$$(2) \quad v(K) = v_K(r_1, r_2, \dots, r_{i-1}, r_i, r_{i+1}, \dots, r_k).$$

Since the pareto-efficient payoff will be reached if all players cooperate, a stable coalition must be in the core⁶, the set of all undominated imputations. Any vector in the core is individually rational, coalition-rational, and group-rational (pareto efficient). Individual rationality is fulfilled, if i 's share of the payoff in any coalition in which player i participates is at least what i could get as stand-alone value, $v(\{i\}) = v_i(r_i)$, by refraining from participation. Coalition rationality is conceptually the same, replacing player i by subcoalition K . Group rationality is the equivalent of pareto efficiency. If a coalition would not be in the core, the coalition would therefore not be stable. Either the coalition could do better without

⁶Note that elements of the core are internally stable in that no element of the core dominates another element of the core, but not externally stable - vectors in the core might be dominated by vectors that are not in the core, but these vectors would in turn be dominated by (other vectors that are dominated by) a vector in the core.

an additional player that provides no additional value beyond his share of the coalition value, or the player could do better by refraining from taking part in the coalition. If the coalition of a subcoalition T and player i is not superadditive in that the coalition value is at least as big as the sum of T 's coalition payoff and the payoff i can get on his own, in sharing the payoff of $T \cup \{i\}$ either T or i would have to give up some of the payoff they could get on their own:

$$(3) \quad v(T \cup \{i\}) \geq v(T) + v(\{i\}) \forall T \forall i, i \notin T.$$

If the core were empty, this would imply, that there is no common grounds for a proposal by the players in the committee. But if the core is not empty, it yields all vectors that could represent the resulting proposal. Assuming that the game can be represented by the unit simplex (3-dimensional unit cube) for three players with diametrically opposed interests, as depicted in figure 1, and, assuming further, that the dashed lines represent the constraints implied by individual, coalition and group rationality, for players one to three, respectively, the triangle between the dashed lines, C, would be the core.

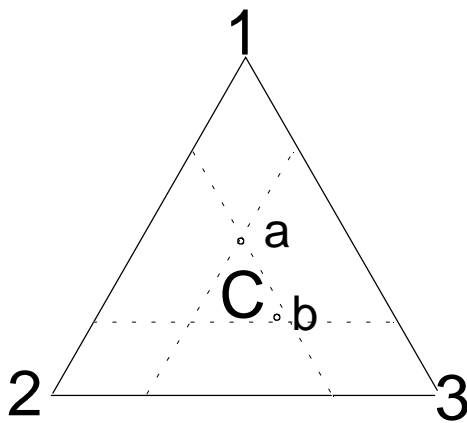


figure 1: The core

Every vector in the core represents a proposal that would be acceptable from all three players' perspectives. Each proposal would be the closer to a players preferences, the further to the players' origin it is. In the example in figure 1 player one would prefer point a to point b.

But the question, which proposal would result, is still not answered. Therefore we apply the Shapley value, that proposes an element of the (non-empty) core. The Shapley value for player i joining coalition K ⁷, ϕ_i , is:

$$(4) \quad \phi_i(v) = \sum_{K \in \mathcal{N}, K \ni i} \frac{(n-k)!(k-1)!}{n!} (v(K) - v(K - \{i\})).$$

More precise, in combination with (1):

$$(5) \quad \phi_i(v) = \sum_{K \in \mathcal{N}, K \ni i} \frac{(n-k)!(k-1)!}{n!} (v(r_1, r_2, \dots, r_{i-1}, r_i, r_{i+1}, \dots, r_k) - v(r_1, r_2, \dots, r_{i-1}, r_{i+1}, \dots, r_k)).$$

The Shapley value, i.e. the vector that results for all players $i \in N$, $\phi(v) = (\phi_i(v))$, yields the share of the payoff each player will receive. In the context of our proposal-definition process this can be interpreted as the relative⁸ closeness of the resulting proposal to a player's preferences. In figure one, the bigger a player's Shapley value, the closer the vector represented by the Shapley value will be to this player's origin, i.e. to this player's preferences.

This implies that if a player's Shapley value is zero, the proposal will not be influenced by him or his preferences, respectively. Of course it could still be in his favour, but not due to his ability to influence the outcome. He would only be lucky.⁹ A dummy player, receiving nothing from the payoff, would therefore not participate actively in the committee.

Therefore we can interpret the Shapley value $\phi_i(v)$ also as the probability that the player will participate actively in a committee. This implies that $\phi(v)$ yields the probability of the players to participate actively and to influence the resulting proposal.

Furthermore, the Shapley value represents a reasonable and fair proposal, given the resources of the committee members. The Shapley value is "fair and reasonable" inasmuch as the Nash bargaining solution is, since in case of given conflict payoffs, the Shapley value and

⁷I.e. i and $K - \{i\}$ form coalition K .

⁸Note that the Shapley value sums to unity for a payoff of one for the (pareto-efficient) grand coalition, as in our example.

⁹With 'lucky' we refer to the usual distinction between power and luck in the sense of Barry (1980), i.e. the random correspondency of preferences and, in this case, proposal.

the Nash bargaining solution coincide.¹⁰ Since, as mentioned before, the proposal-definition process is a bargaining process between committee members, it seems appealing to propose the Shapley value as a fair solution for this process, emphasising the interpretation given above.

III. Probabilistic power within partial homogeneity

Now we will have a closer look at the composition of the committee. As mentioned above, the main difference between public and private committees is the number of deciders, generally depending on the size of the organisation. Within companies the different players involved in the decision process mostly are representatives (managers) of the different departments (e.g. the sales department and technical or production departments as well as business administration including accounting)¹¹. Every player has his own interests and is in favor of a given proposal with some probability. But some groups of players of e.g. closely related departments might have the same or similar probabilities of accepting or rejecting a proposal, e.g. due to similar interests. The same setting is applicable to public organisations, since the analysis of power in a committee is the same, regardless of whether we consider the decision of political parties about a new law in parliament, or a decision between different company-political groups within a company, or between different pressure groups representing industry-, consumer- or national¹² interests in (other) public organisations.

¹⁰For a compact and convex payoff space, the Nash product exists and is unique, compare Harsanyi, 1977, pp. 226-231.

¹¹The pressure groups are thus essentially the same as with public organizations, only on a different level, since departments and not political groups are involved. But there is a political structure in every company as well.

¹²E.g. in CEN - Commite European den Normalization - the members, which are the national standardisation organisations of EU and EFTA countries, represent their countries.

Therefore we examine the proposal-definition process in a committee within a partial homogeneity setting as introduced in Straffin (1977). Following Straffin, Davis, and Brams (1982) we consider a voting body that is ideologically divided in three groups, of which two are homogeneous within the group, but independent of the other group, and a third group, whose members are independent of each other within the group and independent of the other groups.

Homogeneous means that the committee members in these groups are homogenous and their votes are totally correlated, leading to unanimous decisions. The meaning of independence is that the probabilities of players within this group are uncorrelated, so that the probability of voting ‘yes’ is 0.5 for every member of the group. Here an extreme case would be if the probability for the two homogenous groups were $p = t$ for one group and $p = u = 1 - t$ for the other.

The term voting might seem beside the point in a proposal-definition process as described above. We simply interpret voting here as acceptance or refusal of a possible proposal that results from the ongoing bargaining of the members. Although no votes are cast, it seems reasonable to assume that a proposal will be affirmed, if consensus of the members is required. Thus it should be appropriate to interpret power in a probabilistic conceptualization, which simply means to interpret power as the probability for some outcome. We therefore introduce the definition of a voting game g as $g = (d; \mathbf{w}; \mathbf{p})$ with a decision rule d , a vector of voting weights, $w = (w_1, \dots, w_n)$ with $w_i \in [0, 1]$ such that $\sum_{i=1}^n w_i = 1$, and a vector of probabilities $p = (p_1, \dots, p_n)$ with $p_i \in [0, 1]$ for the respective $i \in N$ voting for a specific proposal. A high p_i thus means a high probability to accept a proposal, or a high acceptability level. And $p_i = t \forall i$ means that the voting body is homogenous and the votes are totally correlated, leading to unanimous decisions. We assume that for the first homogenous group,

called A , $p_i = x_1 \forall i \in A$, for the second homogenous group, B , $p_i = x_2 \forall i \in B$, both uniformly distributed on $[0, 1]$. For the group of independent voters, C , the probabilities are assumed to be uniformly distributed random variables $p_i = x_3 \forall i \in C$ on $[0, 1]$. The set of all possible coalitions, 2^n could then be interpreted as the set of all corners of the n -dimensional unit cube, $\{0, 1\}^n$, i.e. all vectors (x_1, x_2, \dots, x_n) with $x_i = 0 \vee x_i = 1 \forall i$. Allowing for all possible probabilities makes a linear (in each variable) extension throughout the unit cube, i.e. $[0, 1]^n = \{(x_1, x_2, \dots, x_n) \mid 0 \leq x_i \leq 1 \forall i\}$, necessary, which leads to the definition of Owen's (1972) multilinear extension $f(x_1, x_2, \dots, x_n)$ for any fixed random coalition S :

$$(6) \quad f(x_1, x_2, \dots, x_n) = \sum_{S \subseteq N} \left[\prod_{i \in S} x_i \prod_{i \notin S} (1 - x_i) \right] g(S) \text{ for } 0 \leq x_i \leq 1 \forall i.$$

The probabilities for classes of coalitions (e.g. W = winning coalitions) can thus be calculated by summing the probabilities over the respective classes of coalitions, which yields the power polynomial, the i^{th} partial derivative of the multilinear extension (the derivative with respect to i):

$$(7) \quad f_i(x_1, x_2, \dots, x_n) = \sum_{S \in W} \left[\prod_{j \in S \setminus \{i\}} x_j \prod_{k \in N \setminus S} (1 - x_k) \right] [g(S) - g(S \setminus \{i\})].$$

Here x_j would be the probability that $j \in S$ votes 'yes' and x_k would be the probability that $k \notin S$ votes 'yes'. In case of a homogenous voting body (7) represents the Shapley value.

For a decision within a company this could mean that department A would have an interest in goals diametrically opposed to department B , while department C is independent. For example there is a clash of interest between a revenue-oriented sales department and a profit-oriented business administration department, while the technical department does neither have strong preferences for revenue nor profit, since it is interested in the technology that is sold. In the public context environmentalists and industry representatives and the automobile association might serve as an example in the case of a decision about the introduction of catalytic converters for private cars.

In our simple example of a 3-person (one from each department) simple majority game in (0,1) normalization the multilinear extension would be:

$$(8) \quad f(x_1, x_2, x_3) = x_1x_2(1 - x_3) + x_1x_3(1 - x_2) + x_2x_3(1 - x_1) + x_1x_2x_3 \\ = x_1x_2 + x_1x_3 + x_2x_3 - 2x_1x_2x_3$$

with x_i being the probability that player i votes 'yes'. Thus the power polynomials with respect to the players would be (by symmetry):

$$(9) \quad f_1(x_1, x_2, x_3) = x_2 + x_3 - 2x_2x_3$$

$$(10) \quad f_2(x_1, x_2, x_3) = x_1 + x_3 - 2x_1x_3$$

$$(11) \quad f_3(x_1, x_2, x_3) = x_1 + x_2 - 2x_1x_2$$

and hence, e.g. for the independent player 3:

$$(12) \quad \int_0^1 \int_0^1 f_3(x_1, x_2, x_3) dx_1 dx_2 = \int_0^1 \int_0^1 (x_1 + x_2 - 2x_1x_2) dx_1 dx_2.$$

Straffin, Davis, and Brams (1982) have shown for a nine-member voting body with identical voting weights for all players and a simple majority decision rule under partial homogeneity, as described above, that the following conclusions concerning power can be drawn:

Members of the larger of the two opposed groups have more power than independent voters, who still have more power than voters of the smaller of the two opposed groups. If this imbalance increases, every member loses power. If the body becomes instead more polarized since independent voters join the opposed homogenous groups, average power declines. But if a member changes his views towards the larger of the two opposed groups, his power will remain constant. If the opposed groups are of equal size, independent members of the voting body exert more power than any members of the two opposed groups.

With regards to caucuses, members of a homogenous caucus, that consists of e.g. three members of one group, lose power, if the voting body is ideologically balanced and gain

power if the body is imbalanced. Members of cross-ideological caucuses, that consist of one member of each group always gain power.

These results could be of paramount interest to e.g. a newly elected board of directors that is revenue-oriented and therefore could implement voting rules with a tendency towards the sales department, by slightly changing the voting weights and increasing the voting weight of the sales department compared with the technical or business administration departments. This could, for example, be done by changing the composition of a decision-making body or by requiring that the committee that prepares a proposal is composed in the same line. Let's assume that in this case a decision has to be made, whether conflicting interests of the sales or the business administration department will be accounted for. A change in the composition of the body by increasing the number of salespeople and decreasing the number of business administration folks, accordingly, will intuitively lead to increased power of the sales department and decreased power of the business administration department. But it has to be regarded, that the power of the technical department might also increase, when the new composition leads to a new balance between the sales and the business administration departments.

Of course a partial homogeneity setting can also apply to committees of other organisations or public entities, e.g. the federal German parliament in the 1970s, where only three parties represented the electorate. The implications might serve well in the process of setting up new or changing existing institutions.

IV. Conclusions

Generally (voting) decisions are analysed assuming a given proposal. We described the process of creation and definition of a proposal, that precedes the actual (voting) decision,

in more detail. Within the unifying framework that we presented for any kind of large organisation the main result is that the process of proposal-creation and definition often is of much more importance than the actual decision. Within this process a proposal evolves, shaped in multilateral negotiations and cooperative bargaining. The vested interests of all persons and groups that take part in its development coin it in negotiations. The resulting proposal is generally accepted by mutual consent. Although different groups and persons are involved in different organisations, the process is nevertheless the same. The preparation of a proposal is of a private good character, independent of the character of the actual decision or the final product.

The formal power of deciders might be smaller than the informal power of the group of proposal-preparers in the working group or agenda-setting committee, mainly for two reasons: the proposal will be prepared in mutual consent by a committee associated and linked with the voting body. This consent would be forestalled by members that reject the proposal. And since the composition of the committee will to some degree resemble the composition of the voting body, a group that cannot provide sufficient resistance in the committee can barely be expected to be powerful enough in the voting body. Furthermore, many large organisations try to reach mutual consent or unanimity. Sometimes this is even carved in stone.

In our interpretation of the analysis of the proposal-definition process in a committee, every vector in the core represents a mutually acceptable proposal. If measured in unit space, the closer a vector is to a player's origin, the closer it is to his preferences. We interpret this as the relative closeness of the proposal to a player's preferences, yielding a higher Shapley value for a player, the closer the proposal is to his preferences. Thus the Shapley value can be interpreted as the players' probability to participate actively in a committee and to influence

the resulting proposal. Furthermore, the Shapley value proposes a fair and reasonable proposal.

In the last section a partial-homogeneity based probabilistic voting model was presented, that might serve well for determining the rules for decision-making, including the proposal-definition process in working groups, from the perspective of the one who sets up the rules.

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