

An Experiment in Perceived Fairness versus Theoretical Fairness in Allocation Problems

(Extended abstract for the 15th IPSERA Conference April 2006, San Diego)

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Summary

The unfair allocation of gains often leads to conflicts in purchasing cooperatives. Cooperative game theory proposes some solutions to unfair allocations: we already know **(a)** several properties of fairness, we know **(b)** how to develop **(c)** allocation methods building on these properties, and we know **(d)** how to calculate **(e)** actual allocations using these methods. So, we know the theoretical fairness of allocating, but an analysis of the perceived fairness of allocating is lacking. Therefore, we set up an experiment to study the perceived fairness in the five steps of the allocation process (from a to e). The preliminary results of our first experiments already show large differences in perception between the five steps and within each of the steps. In the final working paper we will confront our complete empirical results with theoretical results and propose: If one would want to influence perception the focus should be on steps b and d. If one would want to influence theory the focus should be on steps a and c.

Keywords

Perception of Fairness; Theory of Fairness; Cooperative Game Theory; Allocation Problems; Cooperative Purchasing

Introduction of the topic

Allocation conflicts often occur in purchasing cooperatives in which the participating organizations differ from each other. Due to these differences it is difficult to find agreement on the fair allocation of cooperative gains and costs. This problem has been noted by several authors (e.g. Heijboer, 2003; Kamann, 2004; Schotanus, 2004). Some authors already proposed possible solutions to these problems (e.g. Heijboer, 2003; Schotanus, 2004; Singer, 1985). They proposed, analyzed and compared several allocation methods, like:

- Adapted compromise value (Schotanus, 2004);
- Average cost pricing (e.g. Heijboer, 2003);
- Compromise value (Borm, 1992);
- Differential pricing;
- Equal amount (e.g. Heijboer, 2003);
- Equal price (e.g. Schotanus, 2005)
- Nucleolus (Schmeidler 1969).

by using properties of fairness (e.g. Friedman 2003; Heijboer 2003; Moulin 2001; Schotanus 2004; Shapley 1953) in terms of cooperative game theory, like:

- Additivity;
- Dummy;
- Efficiency;
- Fair ranking added value;
- Fair ranking purchasing volume;
- Monotonicity;
- Stability;
- Symmetry.

Consequently, we already know **(a)** several properties of fairness. We know **(b)** how to develop **(c)** fair allocation methods building on these properties. And we know **(d)** how to calculate **(e)** actual allocations using these methods. Now, one could state that the more properties of fairness in an allocation method are satisfied the fairer the method is. This is what we call theoretical fairness of allocating. The question remains whether or not this fairness is also perceived by practitioners in cooperative purchasing. This is what we call perceived fairness of allocating (see figure 1). A thorough analysis of the perceived fairness of these five steps is lacking in literature.

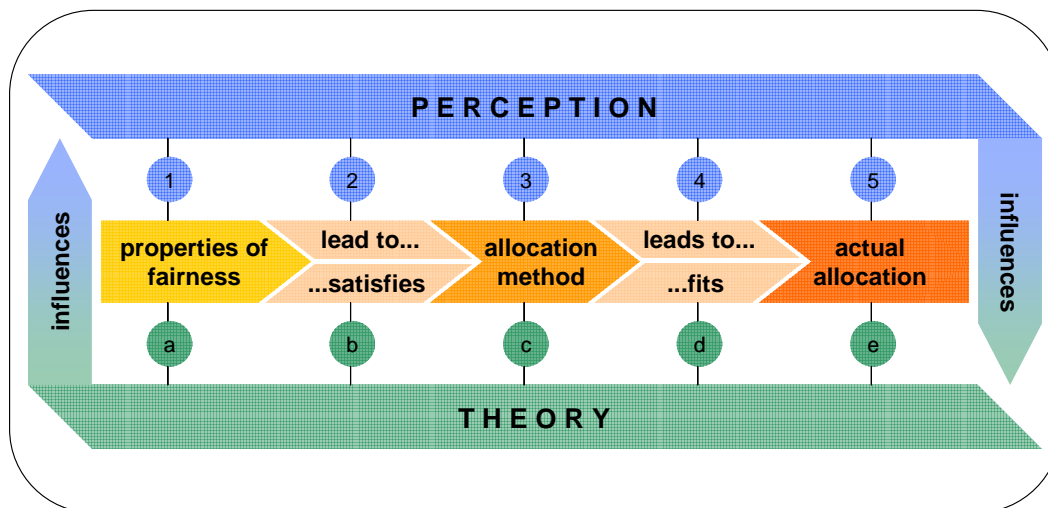


Figure 1. Perception versus Theory in the Allocation Process

Research relevance and objectives

It is not known in cooperative purchasing:

- Step (1) To what extent the perceived importance of properties of fairness differs among practitioners. It could be that a certain allocation method satisfies seven out of eight properties of fairness. On the surface of it this may sound fair, but if the eighth property that is not satisfied is perceived as very important the allocation method is not perceived fair after all. Furthermore, the importance of properties of fairness may depend on the characteristics of practitioners and organizations. This may lead to conflicting perceptions of the fairness of allocation methods;
- Step (2) Whether or not it is perceived that an allocation method satisfies properties of fairness. For instance, it might be that a practitioner perceives that an allocation method satisfies a certain property of fairness, but that it can be proven mathematically that this perception is false;
- Step (3) Whether or not fair allocation methods in terms of cooperative game theory are perceived to be fair in practice as well;
- Step (4) Whether or not it is perceived that the actual allocation of an allocation method is perceived to be as fair as the corresponding allocation method. For instance, it might be that a practitioner perceives a certain allocation method as fair, but that the actual allocation of gains in cold hard cash is not perceived as fair;
- Step (5) Whether or not the actual allocation is perceived to be fair.

It is our objective to shed more light on these steps by using an experimental setting. We confront our empirical results with theoretical results. Furthermore, we analyse which steps should be influenced if one would want to influence perception and/or theory. Our practical objective is to find a fair allocation method that is not only fair in theory, but is also perceived as fair.

Organizational context

The heads of purchasing of eleven organizations of one purchasing cooperative are involved in our experiment. The cooperative is often considered as a classic example of successful

cooperative purchasing in its homeland. Nevertheless, the cooperating organizations are not always like hand and glove. The added value of cooperating is sometimes a discussion point, as is the allocation of gains. The allocation is difficult for this cooperative as these organizations differ from each other.

Methodology

In order to get a more complete understanding of cooperative purchasing between the eleven organizations we first carried out two interviews with key persons. Based on these first interviews, secondary data, and several studies related to cooperative purchasing we built a draft questionnaire with a mix of question types. The questionnaire was first sent to a focus group to test the questions. The final questionnaire consisted of three parts.

The first part consisted of some general questions which were not already answered by secondary data. The second part consisted of two experimental cases based on actual contracts of the cooperative for which the allocation of gains was proven to be difficult. For both cases we provided six actual allocations based on six allocation methods, but we did not provide information on which allocation method was used. For all allocations the respondents were asked to indicate whether or not they perceived the allocation as fair (on a five point Likert-scale). We also asked them to explain their choices. The third part consisted of questions related to:

- The perceived importance of several properties of fairness (on a five point Likert-scale);
- Whether or not several properties of fairness are satisfied for the well-known equal price method (on a true or false scale with a don't know option);
- Whether or not several allocation methods are perceived as fair (on a five point Likert-scale). Again, we also asked them to explain their choices.

The final phase of our study will probably involve a discussion workshop. The study report will be distributed to all members of the cooperative with a final request for feedback on perceived discrepancies and on key issues to compensate for nonresponse bias and misinterpretations.

Preliminary results

The preliminary results of our first experiments among three organizations already show large differences between the five steps. Also, there are already large differences between the scores of the organizations within each of the steps. As we are still carrying out experiments it is not very useful to analyse our first experiments into detail, but some outcomes per step are already:

- For some experimental cases one allocation method was perceived as fair, while in other experimental cases another allocation method was perceived as fair by the same organization;
- Large differences are found between steps 3 and 5 for some allocation methods;
- All organizations perceive monotonicity as important and think that the equal price method and the differential pricing method satisfy this property. However, this is theoretically not correct. Equal price and differential pricing do not satisfy this property in general;
- Some allocation methods that are theoretically fair are perceived as unfair.

Differences between perception and theory raise many questions: Do we want to influence perception? Do we have to change the theory? And if we want to influence these, how can we do

that and which steps should we try to influence? In the final working paper we will confront our complete empirical results with cooperative game theory and propose: If one would want to influence perception the focus should be on steps 2 and 4. If one would want to influence theory the focus should be on steps a and c. Further research to influencing theory might be even more difficult than influencing perception. In order to influence theory to create a better fit with perception one might need a new rigorous way of thinking.

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