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Coalition structure values in differential information economies: is unity a strength?

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Abstract

The coalition structure (CS) value, introduced by Owen [G. Owen, Values of games with a priori unions, in: Essays in Mathematical Economics and Game Theory, Springer Verlag, Berlin, 1977] and Hart and Kurz [Econometrica 51 (1983) 1047], generalizes the Shapley value to social situations where coalitions form for the purpose of bargaining. This paper introduces the CS value to economies with differential information. We show that the private CS values exists and is Bayesian incentive compatible. Moreover, we construct examples that go against the intuitive viewpoint that “unity is strength”. In particular, we consider a three-person economy in which two agents bargain as a unit against the third agent. We show that bargaining as a unit is advantageous if and only if information is complete. This result sheds new light on bargaining under differential information. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Recent work on differential information economies has indicated that cooperative solution concepts, such as the core, the Shapley value, and the bargaining set provide successful alternatives to the rational expectations equilibrium (see [Allen and Yannelis, 2001](#) and the references therein). In particular, as first shown in [Krasa and Yannelis \(1994\)](#), the Shapley value is sensitive to information asymmetries and rewards agents with superior information, features that are not shared by the traditional rational expectations equilibrium.

In this paper, we pursue this line of research further, going beyond [Krasa and Yannelis \(1994, 1996\)](#), by introducing differential information into the coalition structure (CS) value

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concept of Owen (1977) and Hart and Kurz (1983). One of the main properties of the CS value is that if agents are allowed to form coalitions to bargain as a unit, they may do so to strengthen their situation, that is, to increase their payoffs. The intent of the coalition structure value is to take into account situations where groups of players organize themselves for the purpose of bargaining with the rest of the players. Examples include political parties, unions, and cartels. In particular, Hart and Kurz (1983) construct a three-agent economy, in which the first two agents obtain higher payoffs whenever they bargain as a unit against the third agent, compared to the standard Shapley value that allows arbitrary coalition formation.

Given the appealing features of the CS value, it is of interest to know how this concept behaves in differential information economies. To this end we introduce differential information into the CS value concept. In particular, we consider two new equilibrium concepts: The private CS value and the Bayesian incentive compatible (BIC) CS value. In general, the two concepts differ, but we show that: (i) private CS values are always incentive compatible; and (ii) the set of attainable utilities of the transferable utility (TU) game derived from an economy with differential information is always a subset of the set of BIC attainable utilities. It turns out that the private CS value always exists, but the BIC value need not exist because the set of all BIC allocations need not be a convex set.

What we found most surprising, however, is that the intuitive statement that “unity is strength” ceases to be true for the CS value once differential information is introduced. In particular, we construct a three-person economy in which two agents bargain as a unit against the third agent. We show that bargaining as a unit is advantageous if and only if information is complete.

The paper proceeds as follows. In Section 2 we introduce the economy with differential information. In Section 3 we show two alternative ways how a TU game can be derived from an economy with differential information, and a comparison is provided. In Section 4 we introduce the main concepts of this paper, the coalition structure values of a differential information economy. Section 5 shows that coalitional bargaining may not be advantageous if informational asymmetries matter. All proofs are in Appendix A.

2. The economy with differential information

We consider an exchange economy that extends over two time periods, $t = 0, 1$, where consumption takes place in $t = 1$. At $t = 0$ there is uncertainty over the state of nature described by a probability space $(\Omega, \mathcal{F}, \mu)$. Agents are indexed by $i \in I = \{1, \dots, n\}$.

In each state ω there are ℓ goods. The commodity space is therefore \mathbb{R}_+^ℓ . Each agent i 's endowment is given by $e_i : \Omega \rightarrow \mathbb{R}_+^\ell$.

At $t = 0$ agents will agree on net-trades that may be contingent on the state of nature at $t = 1$. However, agents are differentially informed with respect to the true state of nature. Specifically, we assume that at $t = 1$ agents do not necessarily know which state $\omega \in \Omega$ has actually occurred. They know their own endowment realization, and every agent i might have some additional information about the state described by a σ -algebra \mathcal{F}_i with $\mathcal{F}_i \subset \mathcal{F}$. We assume that \mathcal{F}_i is generated by a countable partition of Ω . With a slight abuse of notation we will write \mathcal{F}_i both for agent i 's σ -algebra and for agent i 's partition. By assumption,

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