

The weak core of simple games with ordinal preferences: implementation in Nash equilibrium

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Abstract

In a simple game, coalitions belonging to a given class are “absolutely powerful” while others have no power. We attempt to make this distinction operational. Toward this end, we propose two axioms on social choice correspondences, Strong Non-Discrimination and Exclusion. Strong Non-Discrimination describes circumstances under which certain coalitions, the losing coalitions, have no influence over social choice. Exclusion requires that there are situations in which certain coalitions, the winning coalitions, can exercise their power. We show that the weak core correspondence is the minimal correspondence satisfying Maskin Monotonicity and Strong Non-Discrimination. We also show that the weak core is the unique correspondence satisfying Nash implementability, Strong Non-Discrimination, and Exclusion.

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0. Introduction

This paper studies Nash-implementation of social choice correspondences (SCC for short) on the class of simple games with ordinal preferences. In a simple game, coalitions belonging to a given class are “absolutely powerful” while others have no decision power. In this paper, we attempt to make this distinction operational by proposing two axioms on social choice correspondences, Strong Non-Discrimination and Exclusion.

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Strong Non-Discrimination describes circumstances under which certain coalitions, the “losing” coalitions, have no influence over social choice: for any such coalition and any two alternatives, if all the individuals outside the coalition are indifferent between these alternatives, then the SCC should not discriminate between them, in the sense that one alternative is chosen, i.e., contained in the image of the SCC, if and only if the other alternative is chosen. Strong Non-Discrimination is a strengthening of a condition used in different contexts (Thomson, 1987; Gevers, 1986; and Nagahisa, 1991, 1994). Exclusion requires that there are situations in which certain coalitions, the “winning” coalitions, can exercise their power: for any such coalition, if all the members of the coalition have identical, nontrivial preferences (in the sense that at least two alternatives are not judged indifferent), and, furthermore, all the members of the complementary coalition have trivial preferences (for them all the alternatives are indifferent), then the coalition has the power of excluding at least one alternative.

Some remarks are in order on Strong Non-Discrimination and Exclusion. The former cannot be interpreted as saying that losing coalitions have no power. In fact, it tells us nothing if some member of the complementary coalition finds one alternative preferable to another. Similarly, Exclusion demands that a SCC should grant a winning coalition a “right” to exclude some alternative only in the very special case when all of its members have common preferences and all the members of the complementary coalition regard all alternatives indifferent. Therefore, Exclusion does not seem to grant unlimited power to the winning coalitions. However, we will see that Strong Non-Discrimination and Exclusion become considerably stronger when the important axiom of Maskin Monotonicity is imposed as well.

Recall that a SCC satisfies Maskin Monotonicity if it preserves the desirability of an allocation under transformations of preferences that raise the relative ranking of the allocation. Maskin Monotonicity and Strong Non-Discrimination imply that losing coalitions have no veto power (Lemma 3.10). Furthermore, these three axioms together imply that winning coalitions are “all-powerful” and losing coalitions are “completely powerless” (Corollary 3.6).

Recall the distinction between the strong core and the weak core of simple games. An alternative is in the strong core of a simple game if there exist no winning coalition and another alternative that is at least as good for all members of the winning coalition and strictly preferred by some member of the winning coalition. An alternative is in the weak core if there exist no winning coalition and another alternative that is strictly preferred by all members of the winning coalition. The strong core satisfies Strong Non-Discrimination and Exclusion but violates Maskin Monotonicity (see Remark 3.7). Hence, the distinction between the weak core and the strong core is critical.

We show that the weak core correspondence is the minimal correspondence satisfying Maskin Monotonicity and Strong Non-Discrimination. This is the central result in this paper but, strictly speaking, it is not a full characterization of the weak core. Toward this end, we work with a domain on which the weak core is nonempty. Then, we show that the weak core is the unique correspondence satisfying Maskin Monotonicity, Strong Non-Discrimination, and Exclusion. It is well known that Maskin Monotonicity is necessary

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