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EXPOSITA NOTE

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Socially subjective equilibrium in strategic form games

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Abstract This study provides a new framework and a new equilibrium concept, which are able to describe the situation where people have various images of the society and have various solution concepts for social outcomes, and where people accept the social outcomes. In socially subjective equilibrium, people have a coherence of their own norms in two senses. One is the consistency of the norm itself. Imagined outcomes should satisfy a certain (subjective) solution concept. The other is the consistency between the imagined outcomes and realized one. These are the main features of our equilibrium concept.

Keywords Solution concept scheme · Cooperative game · Non-cooperative game · Subjective game

JEL Classification Numbers C70 · C71 · C72

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1 Introduction

Through newspapers, televisions, the Internet, or our own experiences, we can observe social outcomes, e.g., commodity prices, tax rates, firms’ behaviors, or other consumers’ behaviors. Without the aid of a true image of society, we are sometimes left wondering why such outcomes occur. However, such outcomes are often accounted for through the particular rationality of the individual. One’s discrete rational is probably very different from or not comparable to those of others.

Ichiishi (1981) provided a general framework and a “general” equilibrium concept (social coalitional equilibrium), in an attempt to explain an intermediate situation between cooperation and non-cooperation. Zaho (1992) also provided another framework and equilibrium concept (hybrid solution). For a fixed coalitional structure players are cooperative in their belonging coalition and are non-cooperative among other coalitions. These general frameworks can deal with different solution concepts, i.e., cooperative and non-cooperative solution concepts.

However, this variety of frameworks occurs according to the disparate point of view that exists within a society that contains coalitional actions. That is, one is an inter-coalitional solution concept and another is an internal solution concept in each coalition. In our real society, the diversity exists on a common level; i.e., even though one solution concept is non-cooperative and another is cooperative, they can exist on the same level. Hence we will address this phenomenon by providing the concept of socially subjective equilibrium (SSE). In a SSE, players reach coherence in their own norms in two senses. One is the coherence of the norm itself. Conjectured outcomes should satisfy some fixed solution concept of each player. The other is the coherence between the conjectured outcome and the realized one. These are the main features of our equilibrium concept.

The standard Bayesian incomplete-information framework also deals with situations where players are uncertain about their opponents’ payoff. If all players’ solution concepts are Nash equilibrium in our framework, the SSE outcomes of the game may be described as the special case of the corresponding Bayesian game by setting the probability of a certain “type” to a point mass. However, this is the case only when all players’ solution concepts are Nash equilibrium. In addition, in the above Bayesian approach, we cannot discuss the relation between objective solution concepts and subjective solution concepts. Lastly, Bayesian Nash equilibrium is also an (objective) solution concept of the corresponding games.

In section 2, we define the SSE and provide several remarks, where we obtain an interesting observation. When all players’ solution concepts are Nash equilibrium, the set of the SSE is exactly the set of Nash equilibrium in the objective game (see Remark 2). In section 3, we provide simple examples, using concrete (and objective) solution concepts, i.e., Pareto efficiency, Nash equilibrium, strong (Nash) equilibrium, \(\alpha\)-Core, and \(\beta\)-Core. Lastly, in section 4, we present a simple application of the Cournot duopoly model. In this model, one firm’s solution concept is Nash equilibrium and the other’s concept is Pareto efficiency. By providing a figure, we show the difference between SSE and two objective solution concepts.