Chapter 1
A Survey of Game Theory Applications in Turkey

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ABSTRACT

This chapter gives a brief review of game theory applications in Turkey. The intention is twofold: first, to provide the reader with an overview of game theory and its applications in Turkey; second, to explore the tractability of economic problems when formulating them as game theory models. The discussion starts with a general description of game theory models and follows with an investigation of game theory applications performed in Turkey.

INTRODUCTION

Game theory has been widely applied to many economic issues as an effective tool for economic research in developed countries. However, in emerging economies game theoretic techniques have not yet received proper attention. Until the 1970s, the literature of game theory applications to economics was inadequate; however, as a result of the influence of these applications on developmental economics, games have become commonly used in Europe and the USA for modeling situations in which decision makers must make specific actions which have mutual consequences (Fudenberg & Tirole, 1991; Shubik, 1991). Game theory is a mathematical theory of decision making with the outstanding feature of modeling conflict and cooperation in explicit forms. The most critical element in the development of the theory of games is the formal description of the games, consisting of a set of players, a set of strategies, and specification of players' payoffs for the possible outcomes of the game.

The attention drawn to game theory may be attributed to the pioneering work by von Neumann and Morgenstern (1944)[1]. After the appearance of "Theory of Games and Economic Behavior", game theory, as the analysis of strategic interaction, has been applied to economics (Morrow, 1994). Since the Nobel Memorial Prize in Economics was awarded to John Nash in 1994, the number of economic studies of game theory has increased rapidly. However, the small number of studies in developing economies still can be interpreted as a warning signal which indicates that more research should be devoted to game

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theory, especially in these countries. Because this useful tool lies at the heart of the individual decision making, the limited number of the economic studies and findings has historically been the central shortcoming of the extant literature in emerging markets.

This survey collects applications of game theory in Turkey and presents them in a layered perspective. In the chapter, I discuss the issues related to game-theoretic modeling in Turkey as a developing country and review the studies investigating the strategic actions of individual decision makers within a game-theoretic environment. The primary intention of this study is to gain a deeper understanding of game theory models and their applications in Turkey as an emerging economy. The chapter will be organized as follows. Section 2 provides an overview of game models. Section 3 investigates the applications of these models in Turkey. Concluding remarks and views about game theory and its applications are provided in Section 4.

THE FUNDAMENTALS OF GAME THEORY

As a collection of models, game theory investigates the interaction and the strategy of decision makers. The following is a list of some situations involving conflict and competition in which game theory is used (Osborne, 2004):

- Firms competing for business
- Political candidates competing for votes
- Competing experts' incentives to provide correct diagnoses
- The role of threats and punishment in long-term relationships
- The evolution of siblings' behavior towards each other
- Jury members deciding on a verdict
- Animals fighting over prey
- Legislators' voting behavior under pressure from interest groups
- Bidders competing in an auction

Game theory is concerned with finding the best actions for individual decision makers[2] in above-mentioned situations and recognizing stable outcomes, mostly, from the perspective of an external observer (Liqiang et al., 2007). Every game is constructed on the basis of three elements (MacKenzie & Wicker, 2001):

- Strategic interaction
- Constraints on the actions
- The interests of the players

Mathematical Formulations

There are two principal ways in which to represent a game: (i) the normal form; and (ii) the extensive form. These mathematical formulations are used to describe the game models. Game theoretic models are similar to maps, and there is a variety of them reported in the literature. These maps (models) vary depending on the direction one looks and considers how to get there (Bolton, 2010).