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Convergence of strategic behavior to price taking

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Abstract

We address the following issue: what can be said about the degree of competition, in a set of markets with a large number of participants, when no information on the distribution of individual characteristics is available? Our main result is that the proportion of individuals whose strategic behavior differs substantially from price taking, converges to zero as the number of market participants becomes large, regardless of the distribution of characteristics.

JEL classification: D43; D50; C72

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1. Introduction

The theory of exchange in imperfectly competitive markets—i.e., markets where individuals may have non-negligible effects on market outcomes- has found an elegant formulation in the class of models generally referred to as strategic market games. The descriptive nature of strategic market games has made them a very attractive and useful tool in many areas of economics. One such area is the articulation of a theory that explains the emergence of 'price taking'—the building block of Walrasian analysis.

It has been widely accepted among economists that in a system of markets where individual participants are small relative to the market size, individuals have a negligible effect on the determination of market outcomes, so they may be thought of as exhibiting a price taking behavior.

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This 'price taking hypothesis' has been given a (non-cooperative) game theoretic foundation, via the asymptotic convergence of strategic market game outcomes to Walrasian (or 'price taking') ones. The class of strategic market games originating in Shubik (1973) and in Shapley and Shubik (1977) provided a context that proved very useful for this purpose. Several authors, Dubey and Shubik (1978), Postlewaite and Schmeidler (1981), Mas-Colell (1982), Peck and Shell (1989), Sahi and Yao (1989), Amir et al. (1990), among others, have addressed the asymptotic equivalence between strategic market game and price taking equilibria, as the number of individuals increases without limit. Others, Dubey and Shapley (1994) for example, have addressed the issue by direct comparison of market game outcomes to price taking ones in atomless economies.[1] Both of the above methods draw their inspiration from equivalence results via the core.[2]

It was clearly understood since the beginning that 'negligibility' of individuals is intimately related to the 'large number of participants' in the market. Hence, the large number of participants in markets is a fundamental ingredient of the theories of price taking, along both the cooperative and non-cooperative approaches. As it has transpired from those results (confirming parallel studies via cooperative game theory), 'negligibility' is not merely a matter of 'large numbers' but of distribution of characteristics as well. Roughly speaking the conclusion is that price taking behavior obtains when there is a large number of market participants none of whom is exceptional in terms of characteristics.

In this paper we would like to isolate the 'large number of participants' from the rest of the conditions that guarantee price taking. The issue we wish to address is the following: what can be said about the degree of competition, in a set of markets with a large number of participants, when no information on the distribution of individual characteristics is available? We consider this matter worthwhile for three reasons. First, because we find it noteworthy if anything at all can be said about competition with no reference to economic fundamentals other than the sets of markets and participants. Second, the answer to the above question will underlie any of the equivalence results, where a 'large' number of participants is part of the assumptions. In a way the question above can be restated as follows: how much of the equivalence results is due merely to the number of participants in markets, rather than the distribution of their characteristics? Third, this is a rather typical situation that empirical observers are faced with, where the numbers of participants can be determined with some degree of accuracy but their characteristics are unknown or uncertain at best.

Although it is not a primary purpose here to provide a genuine asymptotic convergence result to price taking (Walrasian) equilibria, the main result of this paper garnished with assumptions on distributions of characteristics, can be readily extended to a full equivalence result. In fact, we demonstrate how some well-known results can be obtained rather easily via the methodology developed in this paper, with some additional standard assumptions.

2. The model

Let H be a finite set of agents. There are L commodity types in the economy and the consumption set of each agent is identified with $\Re^L_+$. Each individual is characterized by a preference relation, which is representable by a utility function $u_h : \Re^L_+ \to \Re$, and an initial endowment $e_h \in \Re^L_+$. Throughout the rest of the paper we employ the following assumptions:

[1] A notable exception to these approaches is Peck and Shell (1990), where the number of individuals is finite but the volume of trades increases asymptotically.

[2] See Anderson (1992) for a survey of core equivalence results.