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Empirical research on discrete choice game theory models of entry: An illustration

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Abstract

We discuss the empirical implementation of discrete game theoretic models of firm entry. After presenting a simple model of entry that underlies much of existing empirical analysis, we discuss the major problems that must be tackled when empirically implementing theoretical models, and econometric methods used in the literature. Finally, we present results from a reduced form estimation of a sequential move entry game, using data from the UK hamburger market. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

The last decade has witnessed important advances both in our ability to translate game theoretic models involving discrete choices into econometric models, and in developing relevant estimation methods. Several contributions combine these advances,¹ promising a better understanding of the issues, and

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¹ Examples are Berry (1992), Davis (1999) and Mazzeo (1999). For a general survey of findings on entry, see e.g. Geroski (1995).

firmer answers to some fundamental questions. The objective of this paper is to outline some of the key ideas involved in game theoretic models of entry, then to present some results using data on the UK fast food duopoly.

The remainder of the paper is structured as follows. In Section 2, we discuss a static two-firm entry model, the various issues that arise in the construction of an econometric model, the modelling choices made thus far in the literature, and the econometric methods used. In Section 3 we present an application to the UK fast food market, and some reduced form results. The fourth and last section concludes.

2. Estimation of discrete-choice game theoretic models of entry

Consider an extremely simple two-stage model of entry, where two identical firms producing homogeneous goods decide in the first period whether or not to enter a market. In the second period, conditional on entry, they compete in quantities, for example (what is important is that the firms know the form of second stage competition). The literature concentrates on pure strategy equilibria. Following entry, firms earn profit Π^i ($i \in \{\text{Mono}, \text{Duo}\}$, Mono = monopoly, Duo = duopoly), but in order to enter have to pay a fixed cost of entry, denoted $F > 0$. Thus a firm enters if

$$E[\Pi^i] - F \geq 0. \quad (1)$$

Assuming entry by at least one firm is profitable (but suppressing the determinants of profit for the moment), we expect to see a monopoly structure if

$$\Pi^{\text{Mono}} - F \geq 0 \quad \text{and} \quad \Pi^{\text{Duo}} - F < 0, \quad (2)$$

whereas a duopoly emerges if

$$\Pi^{\text{Duo}} - F \geq 0. \quad (3)$$

All existing structural empirical work on entry relies on some kind of variant of this simple model.² However, there are at least three significant decisions to be made in doing so. The first is that when estimating a simultaneous entry model along these lines, a natural inclination is to use a system of two (or more generally, N , where N is the number of potential entrants) discrete choice (e.g. probit) equations. This is however not straightforward. Firstly, such an econometric model is not identified, as each (probit) equation would have rival k 's entry, a dichotomous variable, as an explanatory variable in the equation for i 's entry. As discussed by Heckman (1978) and Bresnahan and Reiss (hereafter, BR) (1991a), such a model is identified if and only if the system is recursive. In the

² See Reiss (1996) for a useful discussion of modelling approaches.

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