Economics Letters 120 (2013) 509–512

Contents lists available at SciVerse ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Competition, timing of entry and welfare in a preemption game

Rossella Argenziano [a], Philipp Schmidt-Dengler [b,*,1]

[a] University of Essex, Economics Department, Wivenhoe Park, Colchester CO4 3SQ, United Kingdom
[b] University of Mannheim, Department of Economics, L7 3-5, 68131 Mannheim, Germany

HIGHLIGHTS

- We examine a preemption game of entry into a Cournot market.
- Increasing competition does not bring forward first entry.
- All entries after the first one occur too early from a social point of view.
- We provide a parameter condition such that first entry occurs too late.

ARTICLE INFO

Article history:
Received 20 March 2013
Received in revised form
29 May 2013
Accepted 7 June 2013
Available online 14 June 2013

JEL classification:
C73
L13

Keywords:
Timing games
Preemption
Dynamic entry

ABSTRACT

We show that in a preemption game of entry into a Cournot market, increasing the number of competitors beyond duopoly does not bring forward the time of first entry. We also show that all entries, except the first one, occur earlier than socially optimal.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

In preemption games of entry, there is an early mover advantage which gives players an incentive to enter early, even if the entry cost declines over time. In particular, Fudenberg and Tirole (1985) show that in a duopoly, preemption motives bring first entry forward relative to the monopoly, until rents are equalized. Intuition thus suggests that the presence of more competitors should bring forward first entry even more. We rely on an extension of Fudenberg and Tirole's (1985) rent equalization result to examine the effect of further competitors on the timing of entry. We show that first entry time in a duopoly represents a lower bound for first entry time in any oligopoly. Against intuition, more competitors may actually *delay* first entry. Having examined the effect of competition on entry times, we turn to address welfare. We show that in preemption games, all entries except the first one occur too early from a welfare point of view. Whether first entry occurs too early as well, depends on the parameters of the game. The mechanism is similar to the one in Mankiw and Whinston (1986). While Mankiw and Whinston (1986) compare the number of entrants under free entry to the socially optimal number of firms in a static framework, we take the number of potential entrants as given, and compare the equilibrium entry times to the socially optimal entry times in a dynamic model.

2. The model

We model entry in a new market as an infinite horizon dynamic game in continuous time. Our model and assumptions correspond to those in Fudenberg and Tirole (1985), restricting attention to the case of a new market. We allow for $N \geq 2$ potential entrants. Each firm has to decide whether and when to enter a new market. More precisely, at each instant in time each firm that has not yet entered the market observes the number and the identity of the firms already present in the market and chooses one of two actions: "Enter" or "Wait". Entry is irreversible. We restrict attention to pure

* Corresponding author. Tel.: +49 621 181 1832.
E-mail addresses: rargenz@essex.ac.uk (R. Argenziano), p.schmidt-dengler@uni-mannheim.de (P. Schmidt-Dengler).

[1] Also affiliated with CEPR, CES-Ifo, and ZEW.

0165-1765/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.econlet.2013.06.009

strategies[2] and focus on subgame-perfect Nash equilibria. Before entry, a firm receives no profits. We assume that post-entry profits are generated by Cournot competition. Let P denote the market price and Q the aggregate output. Following Corchón (2008) we assume that the inverse demand function is given by the general form $P(Q) = A - bQ^{\alpha}$, with $b\alpha > 0$ and $\alpha > -1$. This specification nests both linear and isoelastic demand. Marginal cost is constant at k and identical for all firms. Assuming $(A-k)\,b > 0$ and $-A\alpha < kN$ guarantees that output and market price are positive. When m firms are in the market, each of them receives instantaneous post-entry profits $\pi(m) = \alpha m^{1/\alpha-1}(A-k)^{1+1/\alpha}/b^{1/\alpha}(m+\alpha)^{1+1/\alpha}$. Hence, there is an early mover advantage: Earlier entrants receive higher profits for some time, because they have fewer competitors in the market.

As suggested by Fudenberg and Tirole (1985), we assume that the present value at time zero of the cost of entering the market at time t is given by $c(t) = c \cdot \exp(-(\rho + r)t)$, where c is the cost of entering at time zero, r denotes the discount rate, and ρ is an exponential decay parameter: The current value cost of entry declines over time at a decreasing rate. The exogenous delay in entry cost and the early mover advantage in profits make this game a preemption game. We assume that $c > \pi(1)/r$: At time zero, the entry cost exceeds discounted monopoly profits. Thus, no firm enters at the beginning of the game, even if it could thereby preempt all other firms and earn monopoly profits forever. Moreover, we assume that there exists a finite τ such that $c \cdot \exp(-\rho\tau) < \pi(N)/r$. Eventually, entry is profitable for all players.

Let the outcome of the game be such that the vector of entry times is $(T^1, T^2, \ldots, T^j, \ldots, T^N)$. If firm i is the j-th entrant, then firm i's payoff is

$$V_i^j(T^1, T^2, \ldots, T^j, \ldots, T^N) = \sum_{m=j}^{N} \pi(m) \int_{T^m}^{T^{m+1}} \exp(-rs)\,ds - c(T^j),$$

where $T^{N+1} \equiv +\infty$. In what follows, we will denote by $t_j(N)$ the j-th equilibrium entry time in a game with N entrants.

3. Results

To describe the equilibrium outcome of the game, we start by defining *stand-alone entry times* (see Katz and Shapiro (1987)). Consider the hypothetical problem of firm i, if it could act as a single decision maker and select the optimal time to enter the market paying cost $c(t)$, thereby receiving flow payoff of $\pi(m)$ forever, for $m \in \{1, \ldots, N\}$. This firm would choose t to maximize the following payoff: $f_m(t) \equiv \pi(m)\exp(-rt)/r - c(t)$. We denote the solution to this problem as T_m^*, and define it as the m-th *stand-alone entry time*. Observe that T_m^* is well-defined for every $m \in 1, \ldots, N$ as the solution to $f_m'(t) = 0 \iff -\pi(m)\exp(-rt) - c'(t) = 0$. The condition is easily interpreted: when considering a marginal delay of entry, foregone discounted profits $\pi(m)\exp(-rt)$ are weighed against cost savings $c'(t)$.

The subgame-perfect Nash equilibrium outcome of the entry game is unique up to a permutation of firms. The construction of the equilibrium entry times relies on the fact that firms must receive the same payoff. Otherwise, there would be an incentive to preempt firms earning a higher payoff. The equilibrium entry times can be constructed recursively.[3] The last entrant solves a single-agent optimization problem maximizing her payoff $f_N(t)$. The last entry time is thus equal to the last stand-alone entry time: $t_N(N) = T_N^*$. The previous $N-1$ entry times are calculated recursively using a rent equalization condition. We distinguish two cases.

First, suppose the stand-alone entry time T_j^* is earlier than the next equilibrium entry time $t_{j+1}(N)$.[4] Then, the threat of preemption brings the j-th equilibrium investment time forward such that $t_j(N) < T_j^* < t_{j+1}(N)$. In particular, $t_j(N)$ solves the rent equalization condition that equates to zero the difference between the j-th and the $(j+1)$-th entrant's equilibrium payoff. It is the value of t that solves the following equation:

$$\pi(j) \int_t^{t_{j+1}(N)} \exp(-rs)\,ds - c(t) + c(t_{j+1}(N)) = 0. \tag{1}$$

Second, suppose instead that the stand-alone entry time of the j-th entrant is later than the next entry time, i.e. $T_j^* \geq t_{j+1}(N)$. This occurs if the preemption race to be the $(j+1)$-th entrant is sufficiently intense. Formally, this is the case if the difference between the equilibrium payoff of the $(j+1)$-th entrant and of the next entrant whom she is not clustered with is positive when evaluated at T_j^*. Denoting by $t_{j+k}(N)$ the next entry time strictly larger than $t_{j+1}(N)$ the condition can be written as:

$$\pi(j+1) \int_{T_j^*}^{t_{j+k}(N)} \exp(-rs)\,ds - c(T_j^*) + c(t_{j+k}(N)) > 0. \tag{2}$$

In this second case, the j-th entrant has no incentive to enter earlier than the $(j+1)$-th. Consequently, the j-th and $(j+1)$-th entries occur jointly, i.e. they are "clustered". That is $t_j(N) = t_{j+1}(N) \leq T_j^*$.

It follows that in both cases any equilibrium entry time t_j, except for the last one, is earlier than the corresponding stand-alone entry time T_j^*: The preemption motive brings entry forward. Based on this characterization of the equilibrium outcome, we investigate two questions. First, we ask whether the presence of more than two potential entrants, i.e. more competition, brings forward the time of first entry in the market. The counterintuitive result that we found is that this is never the case. Formally:

Proposition 1. *The time of first entry in a duopoly game is earlier than the time of first entry in any game with more than two firms.*

To capture the intuition, compare the entry games with two and three firms. In the game with two firms, last entry takes place at the stand-alone time T_2^*. First entry takes place at $t_1(2)$, the time that solves the rent equalization condition (1). Adding a third firm brings forward the second entry time, because the last two entrants compete in a preemption race for the role of second entrant. In turn, an early second entry makes first entry less attractive, because monopoly profits can be earned for a shorter period. Hence, the earlier the second entry is, the less intense the preemption race to be the first entrant becomes. This effect delays the first entry in a triopoly, relative to a duopoly. Panel (a) in Fig. 1 illustrates this mechanism.

The only possible exception to this conclusion is when in the triopoly game the first and second entries are clustered. If the preemption motive to be second rather than third is sufficiently strong, not only are the first and second entry clustered, but they could also be pushed back even beyond the time of first entry of a duopoly game. For this to occur, the difference between duopoly profits and triopoly profits must be sufficiently large. In particular, it must be large relative to the difference between monopoly and duopoly profits, which is not the case in our symmetric Cournot

[2] As in Simon and Stinchcombe (1989) we interpret continuous time as "discrete time, but with a grid that is infinitely fine".

[3] See Proposition 1 in Argenziano and Schmidt-Dengler (forthcoming).

[4] This is always the case for $j = N-1$ because $T_{N-1}^* < T_N^* = t_N$ by construction.

Download English Version:

https://daneshyari.com/en/article/5059503

Download Persian Version:

https://daneshyari.com/article/5059503

Daneshyari.com