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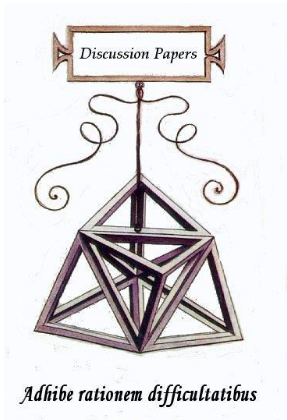


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# A theory of entry dissuasion

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# A theory of entry dissuasion

**Abstract**

In an industry with homogeneous goods, this note compares the standard incumbent's strategic capacity choice vs the incumbent's pre-emptive payment (profit) transfer (PPT) strategy (i.e., pre-entry acquisition). It is shown that, via the transfer option, the incumbent holds its monopoly position "dissuading" the potential competitor entry for a range of fixed costs larger than under strategic capacity. Moreover, in that range, the monopolist via transfer ensures higher payoffs both for itself and the potential competitor. That is, in contestable markets, the incumbent can keep its dominant position in an easier way than standard models predict.

**Keywords:** Entry deterrence; Monopoly; Duopoly.
**JEL Classification:** L13, L21.

## 1. Introduction

The issue of entry in imperfectly competitive markets is pivotal for antitrust authorities and policy, and the definition of barriers to entry is subject of a long lasting debate among scholars (see e.g. McAfee et al., 2004). From a practical view, a barrier to entry can be classified in structural and strategic: the former is "a structural characteristic of a market that protects the market power of incumbents by making entry unprofitable"; the latter is a strategic behavior implying that the actions of incumbents affect entrance choice (Church and Ware, 1999).

Focusing on strategic barriers, in his ground-breaking work, Spence (1977) investigates the choice of an incumbent as regards its capacity when there is a potential entry in an industry. If the entrant faces adequately low fixed entry costs, the incumbent accommodates entry. Under threat of entry, the incumbent can establish an adequately large capacity and, eventually, expand production to cut down the price of the goods and thus deter entry. However, idle capacity remains if entry does not occur.

Dixit (1980) broadens the analysis of the role of an irreversible investment commitment as a tool to deter entry to modify the initial conditions of the post-entry game in favor of the incumbent. He finds that, if firms agree to play the post-entry game in line with the Nash rules, the incumbent does not invest in extra capacity that could be left unproductive in the pre-entry phase.

Shy (1995) presents a basic version of the Spence-Dixit model where an incumbent can accumulate capacity and extra forms of capital to compete fiercely. When the potential competitor observes the incumbent's capacity, the former takes into account the decision of the latter in the post-entry game. Nonetheless, using the first mover advantage, the incumbent can strategically prevent entry by accumulating capital. Given the described structure of the game, entry can be: 1) blockaded, if the potential entrant sidesteps, though the incumbent's action corresponds to what would be optimal for it without threat of entry; 2) deterred, if entry does not occur because the incumbent selects an action that would be suboptimal from its viewpoint if there was no threat of entry; and 3) accommodated, if entry occurs and the incumbent adjusts its behavior to entry.

This note offers a different perspective to the entry game adding an alternative strategic move to the incumbent, i.e. the possibility of transferring part of its monopoly profits to the potential entrant to "dissuade" it from entry. In other words, the incumbent makes a pre-emptive payment (or profit) transfer (PPT) to the potential entrant: this would reflect the case in which the monopolist buys the potential competitor to prevent it to produce.

The "nature" of the problem refers to the fundamental issue of the "contestability of markets". To simplify: 1) for the School of Chicago, in general, it is sufficient the "potential" entry to push the monopolist to set the competitive price (and in the case of just one "potential" entrant, to charge the Cournot price); 2) on the other hand, for Spence-Dixit-Shy - by applying an entry game perspective (with only one potential entrant) with capacity as strategic variable – the incumbent can keep its monopoly position by applying a price lower than that of monopoly, but still higher than that of Cournot (in suitable parametric ranges). Therefore, for the School of Chicago, the monopoly does not exist, in the sense that it is not a problem provided that there is potential competition; on the other hand, for the other scholars such as Spence-Dixit-Shy, it continues to exist despite being "mitigated" by potential competition.

The key results of this note are as follows. If the incumbent makes a PPT to the potential entrant (i.e., it transfers pre-entry part of its monopoly profits), it can hold its dominant position in the industry and "dissuade" the rival to enter for a range of the fixed costs larger than the one recognized under the standard strategic capacity decision. Moreover, in that range, the incumbent monopolist guarantees itself and the potential competitor higher payoffs via transfer. In other words, if in the strategies of the monopolist is included the possibility of making an "offer", and the entrant can "accept" the monopolist's offer (assumptions that are realistic and natural in the business world), then the entry threat effects are weaker than those predicted by the most important entry game provided in the IO literature, i.e. the Spence-Dixit-Shy model. That is, in contestable markets, the incumbent monopolist can retain its dominant position at a level of market power higher than that predicted by standard models. This result is important because, introducing the hypothesis that the monopolist can make a PPT, the present note shows that the monopoly problem still exists more than under the Spence-Dixit-Shy hypotheses. This result sheds new light on the competition theory, enlarging the possibility of preserving monopolistic markets despite the potential competition of entrant firms.

The rest of this paper is organized as follows. Section 2 briefly describes the Dixit-Spence-Shy model and the monopolist profits' transfer option, and the analysis discusses entry in this context. Some extensions are also presented to check the robustness of the findings. The last section closes the paper.

## 2. The model and the results

The model examines a standard entry game where firms produce homogeneous goods for the market; firm 1 denotes the incumbent, and firm 2 the potential entrant. The incumbent has two options: either it chooses capacity to deter entry or it makes a PPT to (i.e. it buys) the potential entrant. When the incumbent chooses capacity, in case of entry, post-entry competition takes place à la Stackelberg.

### 2.1 Monopoly

For operational reasons, the monopoly outcomes are presented first. The inverse, linear demand schedule is $p = a - k_1$, with $a$ denoting the consumers' highest willingness to pay, fixed for analytical convenience to the unity. Profits are

$$\pi_1 = pk_1, \tag{1}$$

where $p$ and $k_1$ denotes the (incumbent) monopolist price of goods and capacity, respectively. For the sake of simplicity, and without loss of generality, the marginal cost of production is fixed to $c = 0$. Maximization of (1) yields $k_1^M = \frac{1}{2}$, the optimal capacity for the incumbent monopolist which leads to the monopolist profits, $\pi_1^M = \frac{1}{4}$, where the upper script *M* stands for "Monopoly".

### 2.2 Capacity choice vs PPT

This subsection analyses the capacity decision of the incumbent and potential entrant in the basic Spence-Dixit framework (Spence, 1977; Dixit, 1980) proposed by Shy (1995, pp. 188-192) vs the incumbent's transfer of profits strategy. In duopoly, the linear demand schedule is $p = 1 - k_1 - k_2$. Therefore, the incumbent and entrant firms' profits are

$$\pi_1 = pk_1 \tag{2}$$

$$\pi_2 = pk_2 - F \tag{3}$$

Firms are identical; however, the potential entrant faces an exogenous, positive fixed cost, $F > 0$. The game has a two-stage structure. At stage 1, the incumbent fixes its capacity $k_1$. At stage 2, after observing the incumbent's move, the potential entrant chooses whether to enter and, in such a case, its own capacity level $k_2$. In the case of no-entry, $k_2 = 0$. The usual backward induction method is used to solve the game.
The market clearing price when firms produce at full capacity is $p = 1-(k_1+k_2)$ and $p = 0$ *if* $1 \leq (k_1+k_2)$. Therefore, the incumbent profits are

$$\pi_1 = (1-k_1-k_2)k_1 \text{ if } 1 > (k_1+k_2) \tag{4a}$$
$$\pi_1 = 0 \text{ if } 1 \leq (k_1+k_2)\,. \tag{4b}$$

while for the potential entrant profits are

$$\pi_2 = (1-k_1-k_2)k_2 - F \text{ if } k_2 > 0 \text{ and } 1 > (k_1+k_2) \tag{5a}$$
$$\pi_2 = -F \text{ if } k_2 > 0 \text{ and } 1 \leq (k_1+k_2) \tag{5b}$$
$$\pi_2 = 0 \text{ if } k_2 = 0\,. \tag{5c}$$

Without threat of entry, the incumbent fixes the capacity level $k_1$ as if it was a monopolist. As a consequence, the incumbent maximizes (1), which yields the equilibrium output, $k_1^M = \frac{1}{2}$ and profits $\pi_1^M = \frac{1}{4}$. As known (Shy, 1995), if firm 1's capacity level is $k_1^M = \frac{1}{2}$, the maximum profit that firm 2 can earn in the case of entry is obtained by solving the problem in
(5a), which leads to $\pi_2 = \frac{1}{16} - F$. Thus, for $F \geq F^B \equiv \frac{1}{16}$, entry into the industry is blockaded (the upper script $B$ stands for blockaded). However, when the fixed costs lower, the incumbent can deter the competitor from entering the market through the strategic decision of producing a suboptimal capacity level with respect to the case of no threat of entry. When $F < F^B$, if the incumbent disregards the competitor's possibility of entry and retains the monopoly capacity, entry will take place. Nonetheless, if it selects a sufficiently high capacity, the potential competitor will find it entry unprofitable. Thus, for $F^{ED} < F \leq F^B$, the incumbent deters entry setting the threshold capacity $k_1^{ED}$ (in which $ED$ stands for entry deterrence), such that the entrant is indifferent between entry or sidestep the industry.
On the other hand, if the fixed costs' size is sufficiently low, i.e. $F \leq F^{ED}$, entry takes place, and the incumbent and entrant earn profits $\pi_i^A, i = 1,2$ (where $A$ stands for accommodated). Direct calculations allow to derive the results in Table 1 (Shy, 1995) which presents the incumbent and entrant's profit expressions as well as the entrant's fixed costs thresholds.

| Incumbent's monopolist profits | Incumbent's entry deterrence quantity, $k_1^{ED}$ | Incumbent's entry deterring profits | Incumbent and entrant's accommodating profits, $\pi^A$ | Fixed cost threshold, blockaded entry $F^B$ | Fixed cost threshold, deterred entry $F^{ED}$ |
|---|---|---|---|---|---|
| $\pi_1^M = \frac{1}{4}$ <br> $\pi_2^B = 0$ | $k_1^{ED} = 1-2\sqrt{F}$ | $\pi_1^{ED} = 2\sqrt{F}(1-2\sqrt{F})$ <br> $\pi_2^{ED} = 0$ | $\pi_1^A = \frac{1}{8}$ <br> $\pi_2^A = \frac{1}{16} - F$ | $F^B = \frac{1}{16}$ | $F^{ED} = \frac{3}{32} - \frac{\sqrt{2}}{16}$ |

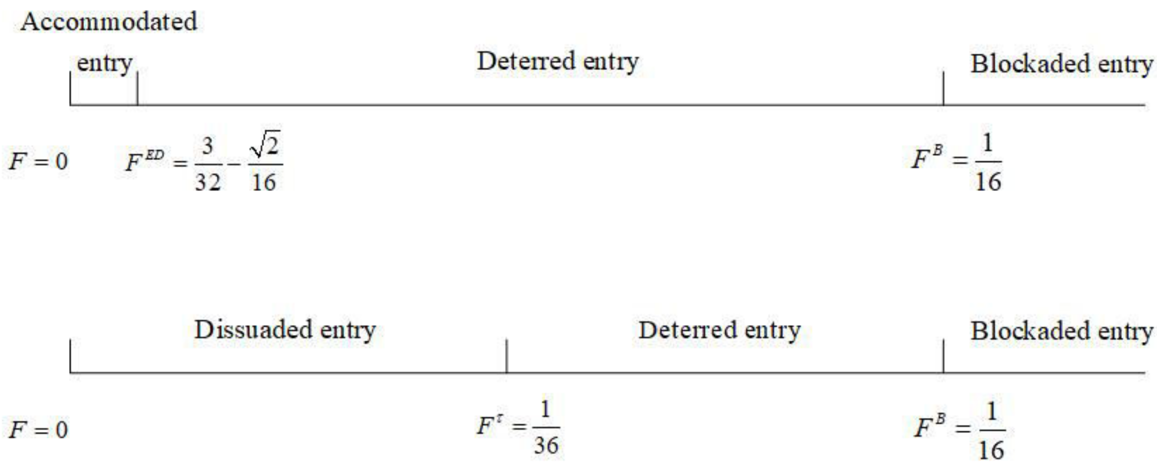
Let us now analyze the case of the incumbent's profits transfer to the potential competitor. To illustrate better the point, consider first the case of $F=0$ which leads, in case of entry, to the Stackelberg model. The incumbent (leader) and entrant (follower) profits are respectively $\pi_1^A=\frac{1}{8}$ and $\pi_2^A=\frac{1}{16}$ . The incumbent, as a monopolist, makes profits $\pi_1^M=\frac{1}{4}$. Suppose now that the incumbent transfers an amount $T$ of its profits to the competitor the keep it out of the market, i.e the transfer is the "profits" of the potential entrant, $\pi_2^T$. An alternative interpretation is that the incumbent buys the potential entrant and does not let him enter the market. To be advantageous, this option musts 1) guarantee the incumbent at least the same profits as Stackelberg leader; and 2) ensure the potential competitor the follower's net profits. That is

$$\pi_1^{MT}=\frac{1}{4}-T\geq\frac{1}{8}+\frac{1}{16}=\pi_1^A+\pi_2^A \qquad (6)$$

where the upper script $MT$ stands for "Monopolist with transfer". The solution of (6) as an equality reveals that $T=\frac{1}{16}$: the incumbent can transfer to the potential entrant precisely the follower's net profits, and therefore it is indifferent between transfer of profits and entry accommodation.

*Table 1: Spence-Dixit-Shy outcomes*

*Figure 1: Standard vs PPT industry structure's pattern*

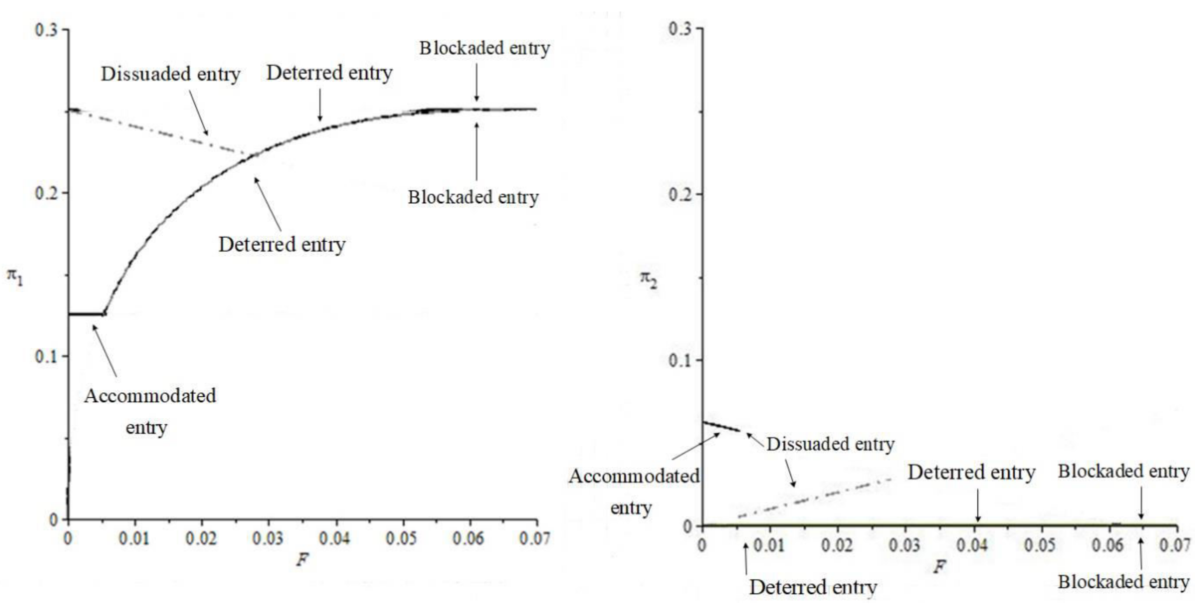



However, it is easy to see that if the fixed costs are $F>0$, then the eq. (6) always holds as a strict inequality for $T=\frac{1}{16}$, that is

$$\pi_1^{MT}=\frac{1}{4}-T>\frac{1}{8}+\left(\frac{1}{16}-F\right)=\pi_1^A+\pi_2^A\ .$$

More in detail, the potential entrant is indifferent because it receives the net follower accommodating profits $\pi_2^T\equiv T=\pi_2^A-F$, while the incumbent is better off because $\pi_1^{MT}>\pi_1^A$. This applies for whichever $T\in[0,F^{ED}\approx .005362]$, in fact, at the upper bound $F^{ED}\approx .005362$, it holds

*Figure 2: Incumbent (left) and potential competitor's (right) payoffs under the two alternative scenarios: PPT vs strategic capacity*




$\pi_1^{MT} = .25 - .005362 > .125 + (.0625 - .005362) = \pi_1^A + \pi_2^A$.

It follows that, for $0 < T \le F^{ED}$, the incumbent can keep its monopoly position in the market and "dissuade" the competitor to enter.

Indeed, the incumbent may even transfer an amount $T > F^{ED}$ such that $\pi_1^{MT} > \pi_1^A$ and $T \equiv \pi_2^T > \pi_2^A$. In fact, if the incumbent opts for the strategic capacity choice, for $F \in [F^{ED}, F^B]$ it selects $k_1^{ED} = 1 - 2\sqrt{F}$ with associated profits $\pi_1^{ED} = 2\sqrt{F}(1 - 2\sqrt{F})$, while the potential competitor stays out of the market with a payoff of $\pi_2^{ED} = 0$.

However, the incumbent monopolist can transfer a part of its profits $T \equiv \pi_2^T > \pi_2^{ED} = 0$ to the competitor and keep it out of the market. The transfer option, to be viable, has to guarantee the incumbent at least the entry deterrence profits, i.e. $\pi_1^{MT} \ge \pi_1^{ED}$, and it is more advantageous than strategic capacity if

$$\pi_1^{MT} = \frac{1}{4} - T \ge 2\sqrt{F}(1 - 2\sqrt{F}) + 0 = \pi_1^{ED} + \pi_2^{ED} \qquad (7)$$

The fixed costs threshold such that the incumbent's transfer option yields a higher payoff than the strategic capacity choice is obtained replacing $T = F$ in (7) and solving, which leads to $T \equiv F^{\tau} = \frac{1}{36} \approx .027778$. Therefore, for $0 < T \le F^{\tau}$, the incumbent monopolist can transfer a fraction of its profits to "dissuade" the potential competitor's entry, and whose value is such that both players get a payoff higher or at least equal to what they would obtain under the strategic capacity game. On the other hand, for $F^{\tau} < T$, then $\pi_1^{MT} = \frac{1}{4} - T \le 2\sqrt{F}(1 - 2\sqrt{F}) + 0 = \pi_1^{ED} + \pi_2^{ED}$ and the incumbent's strategic capacity choice generates a payoff larger than the transfer option; thus, for $F^{\tau} < F \le F^B$, the incumbent installs the capacity $k_1^{ED}$. Finally, for $F^B < F$, entry in the industry is blockaded. Figure 1 summarizes the new proposed industry pattern, while Figure 2 shows the firms' payoff under the two considered options.

These results have a straightforward implication for the competition theory. Indeed, via the transfer

| | Incumbent's monopolist profits | Incumbent's entry deterrence quantity | Incumbent's entry deterring profits | Incumbent and entrant's accommodating profits | Fixed cost threshold, blockaded entry $F^B$ | Fixed cost threshold, deterred entry $F^{ED}$ |
|---|---|---|---|---|---|---|
| Asymmetric costs | $\pi_1^M = \frac{1-c}{4}$ <br> $\pi_2^B = 0$ | $k_1^{ED} = 1-2\sqrt{F}$ | $\pi_1^{ED} = (2\sqrt{F}-c)$ <br> $(1-2\sqrt{F})$ <br> $\pi_2^{ED} = 0$ | $\pi_1^A = \frac{(1-2c)^2}{8}$ <br> $\pi_2^A = \frac{(1+2c)^2}{16} - F$ | $F^B = \frac{(1+c)^2}{16}$ | $F^{ED} = \frac{3+4c}{32}$ <br> $-\frac{2(1+c)\sqrt{2-4c}}{16}$ |
| Differentiated goods | $\pi_1^M = \frac{1}{4}$ <br> $\pi_2^B = 0$ | $k_1^{ED} = 1-2\sqrt{Fg}$ | $\pi_1^{ED} = 2\sqrt{Fg}$ <br> $(1-2\sqrt{Fg})$ <br> $\pi_2^{ED} = 0$ | $\pi_1^A = \frac{1}{8}$ <br> $\pi_2^A = \frac{1}{16g} - F$ | $F^B = \frac{1}{16g}$ | $F^{ED} = \frac{3-2\sqrt{2}}{32g}$ |

option, i.e. the acquisition of the potential competitor, the incumbent has the possibility of keeping its monopoly/dominant position in the market "dissuading" entry for a range of the fixed costs larger than the one identified under the strategic capacity choice, ensuring also for itself and the competitor higher payoffs. This seems to suggest that the incumbent monopolist is, in reality, more "safe as houses" than usually believed. Moreover, also the implications of our results for the competition policy are clear-cut. Since under the transfer option competition in the industry does not improve and this has a negative impact on consumer surplus, and consequently on the overall welfare, then the policy insight is that the business strategy of buying companies before their appearance on the market should be prevented.

### 2.3 Extensions

This subsection briefly discusses some extensions of the basic model to check the robustness of the findings to different firms and market's specifications. All extensive derivations are available upon request.

*Table 2: Spence-Dixit-Shy outcomes, extensions*

| | | | | | | |
|---|---|---|---|---|---|---|
| $n$ symmetric potential entrants | $\pi_l^M = \frac{1}{4}$ $\pi_{if}^B = 0$ | $k_l^{ED} = 1-(1+n)\sqrt{F}$ | $\pi_l^{ED} = (1-n)\sqrt{F}$ $[1-(1-n)\sqrt{F}]$ $\pi_{if}^{ED} = 0$ | $\pi_l^A = \frac{1}{4(1+n)}$ $\pi_{if}^A = \frac{1}{4(1+n)^2} - F$ | $F^B = \frac{1}{16n}$ | $F^{ED} = \frac{1+2n-2\sqrt{n(1+}}{4(1+n)^3}$ |

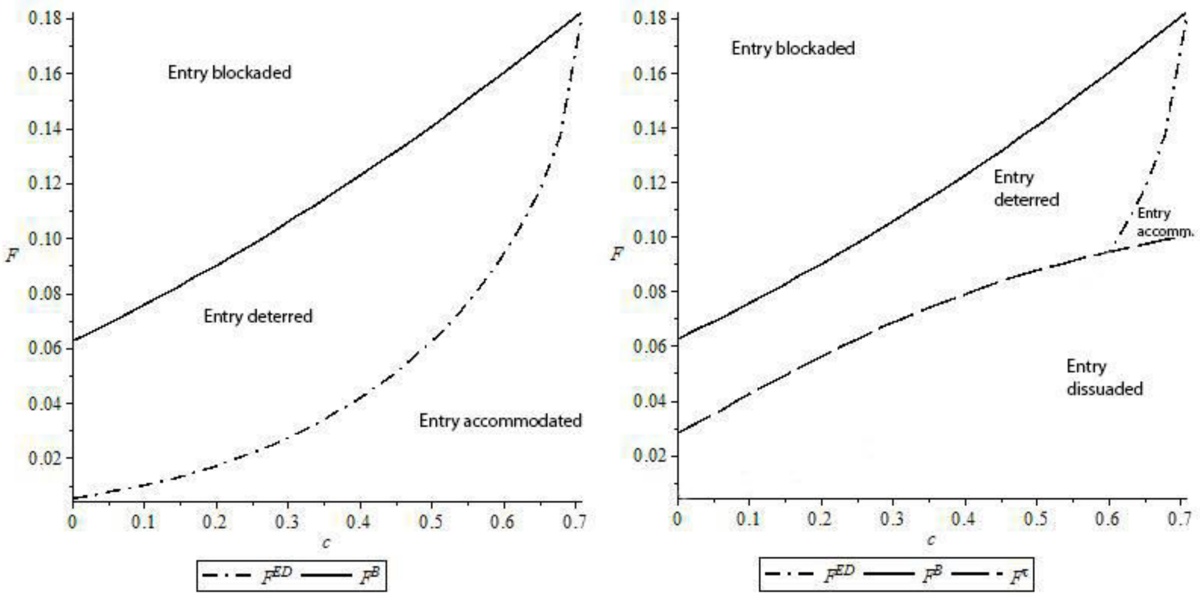
First, a model in which the potential entrant is more efficient than the incumbent leader has been investigated. To capture this asymmetry, it is assumed that the incumbent faces a marginal cost equal to $c$, while the entrant has null marginal costs. To ensure that all technical conditions are fulfilled, the condition $0 < c \leq \frac{1}{\sqrt{2}}$ is imposed. Therefore, the incumbent and entrant firms' profits are, respectively

$$\pi_1 = (1-k_1-k_2-c)k_1 \,,$$
$$\pi_2 = (1-k_1-k_2)k_2 - F \,.$$

Straightforward calculations allow to derive the outcomes reported in Table 2, first row. Intuitively, cost asymmetries work in favouring entry: the more the incumbent is inefficient, the more there is room for the potential entrant. Indeed, Figure 3, left box, shows that an increasing value of $c$ enlarges the parametric area that allows accommodation in the standard model. However, applying the logic of the PPT described in equation (7), Figure 3, right box, reveals that the incumbent can still "dissuade" the potential entrant, unless it is highly inefficient (high costs reduce profits, shrinking the possibility of a transfer) and the fixed costs adequately high. Therefore, accommodation may occur in the case of PPT, but the incumbent has room to maintain its dominant position.

Second, it has been analysed the case in which the potential entrant produces differentiated goods. The market clearing prices are now $p_1 = 1-(k_1+gk_2)$ and $p_2 = 1-(gk_1+k_2)$ where the parameter $0 \leq g \leq 1$ represents the degree of product differentiation. As a consequence, the incumbent and potential profits are, respectively

*Figure 3: Standard (left box) vs PPT (right box) industry structure's pattern, cost asymmetries*




$$\pi_1 = (1 - k_1 - g k_2) k_1 ,$$
$$\pi_2 = (1 - g k_1 - k_2) k_2 - F .$$

Direct calculations lead to the outcomes in Table 2, second row. Intuitively, product differentiation is a force working in favour of entry: the more the entrant's product is different from that of the incumbent, the more market power the potential entrant has. As a consequence, for the incumbent, it is more difficult to impede entry. Figure 4, left box, shows that lower values of $g$ enlarges the parametric area in which accommodation takes place in the standard model. Nonetheless, using the logic of the PPT, Figure 4, right box, reveals that the incumbent can "dissuade" the potential entrant for large degrees of product differentiation, unless the goods are almost independent and the fixed costs relatively high: accommodation can take place under PPT, but the incumbent has a large room to keep its dominant position.

*Figure 4: Standard (left box) vs PPT (right box) industry structure's pattern, product differentiation*

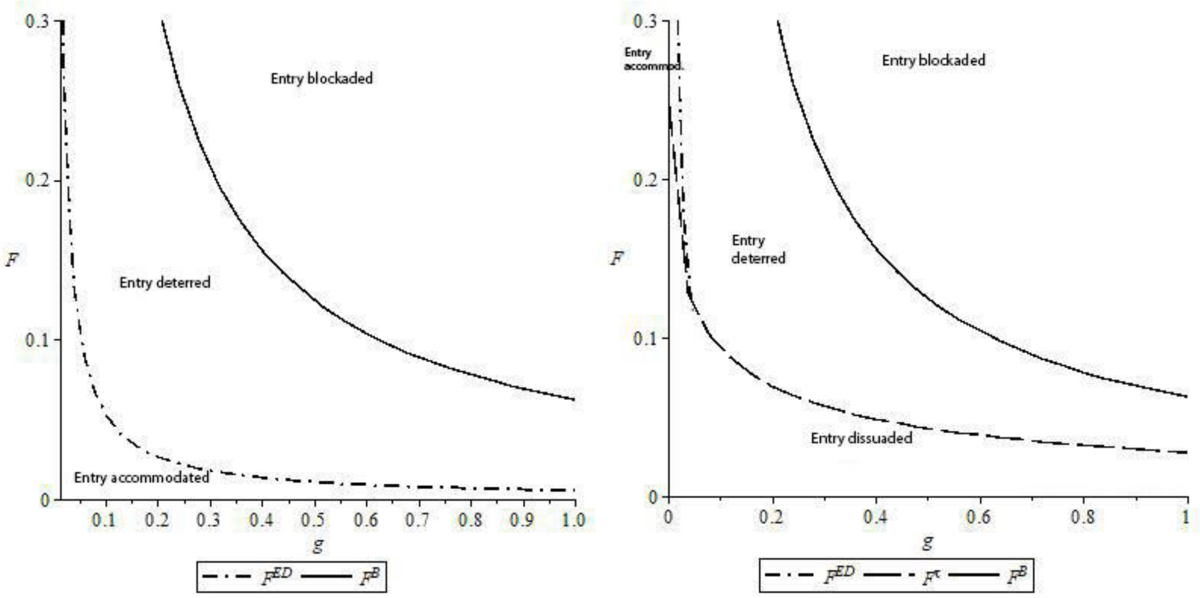
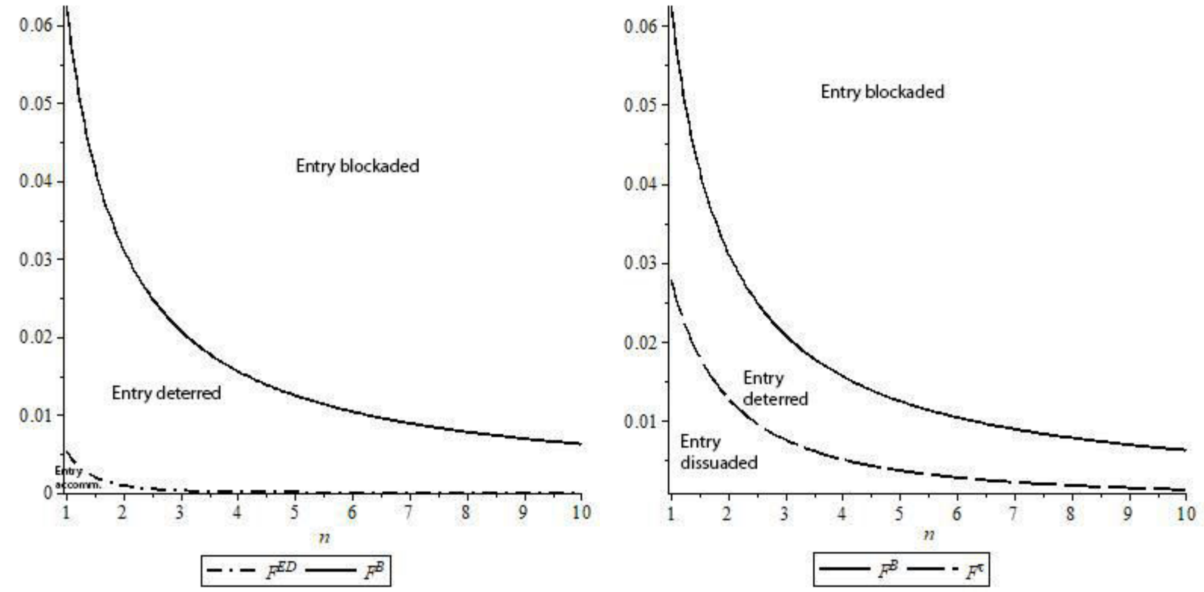



*Figure 5: Standard (left box) vs PPT (right box) industry structure's pattern, several potential entrants*




Finally, a market structure in which a leader faces the potential entry of $n$ symmetric competitors producing homogeneous goods has been considered. The market clearing price when firms produce at full capacity is now $p = 1-(k_l + \sum_{i=1}^{n} k_{if})$ where $k_l$ is the capacity of the leader and $k_{if}$ that of the i-th potential entrant. The incumbent's leader and the i-th potential entrant profits are respectively

$$\pi_l = \left[1-(k_l + \sum_{i=1}^{n} k_{if})\right] k_l ,$$

$$\pi_{if} = \left[1-(k_l + \sum_{i=1}^{n} k_{if})\right] k_{if} - F .$$

Making use of the standard techniques described in the previous subsections, after some calculations one obtains the outcomes in Table 2, third row. Notice that an increasing number of entrants makes the market more competitive, shrinking the profits that each competitor would earn, therefore lowering the threshold of the fixed costs that blocks the entry of the single potential entrant. Using the logic of the PPT, Figure 5, left and right boxes, shows once again that the incumbent can "dissuade" all the potential entrants, with incumbent and competitors all better off.

## 3. Conclusion

This note investigated a novel entry game alternative to the standard textbook model of the entry game based on the strategic capacity pioneered by Spence and Dixit. In particular, in an industry with homogeneous products, this note has compared the outcomes of the standard incumbent's capacity choice strategy in a simplified Spence-Dixit-Shy framework vs the incumbent's transfer of profits (pre-entry acquisition) strategy. It has been shown that, via the transfer option, the incumbent can hold its monopoly/dominant position "dissuading" the potential competitor for a fixed costs range larger than the one recognized under the strategic capacity choice. Moreover, in that range, the monopolist via transfer guarantees for itself and the potential competitor higher payoffs. This result is robust to the presence of 1) cost asymmetries 2) product differentiation and 3) several potential entrants, and reveals that, in contestable markets, the incumbent monopolist can keep its market power at a level higher than that predicted by standard models.

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